Industrial Medicine

for

Physicians and Surgeons in Industry

The Pneumonokonioses (Silicosis)

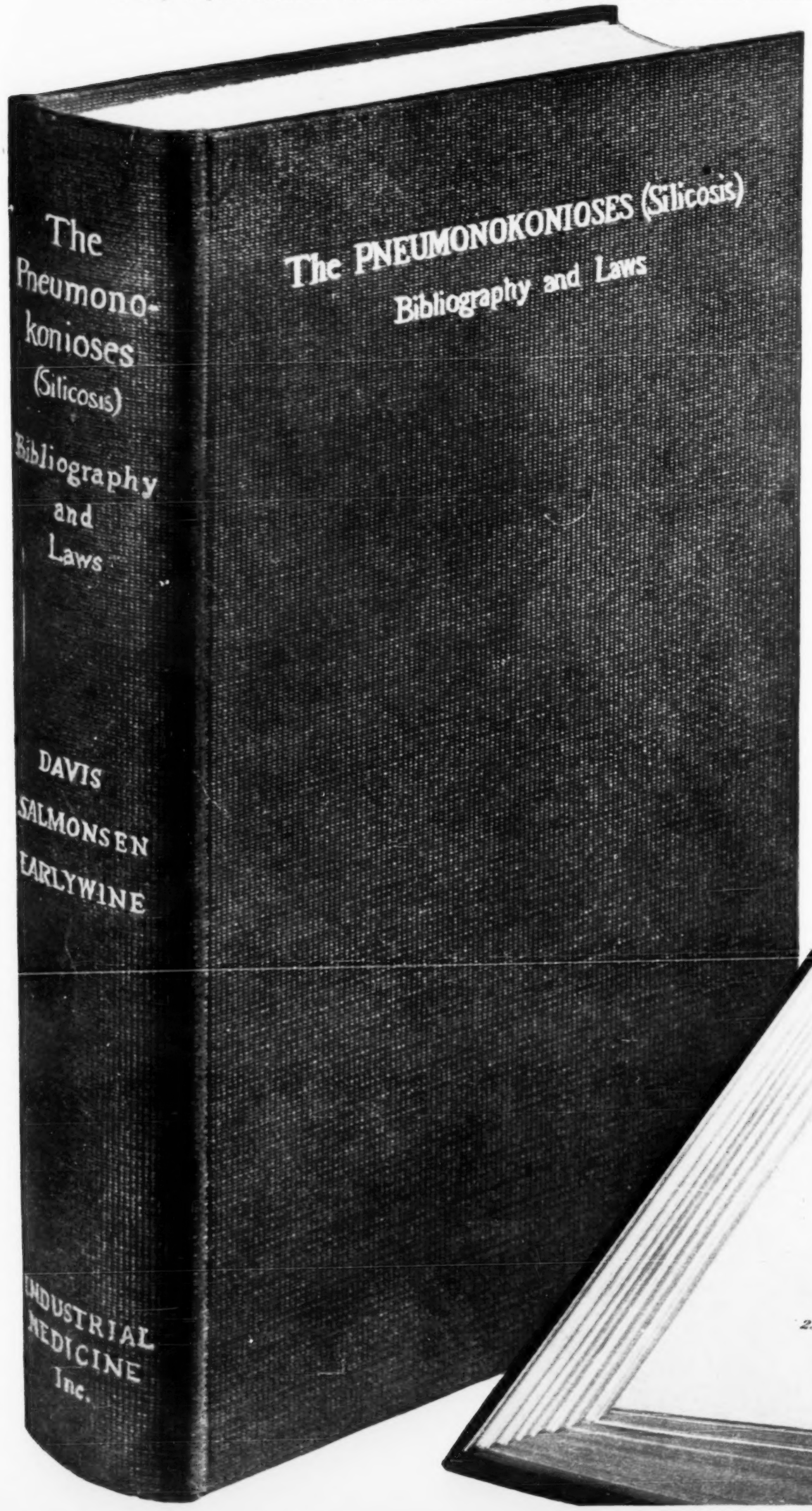
Bibliography *and* Laws Book No. 1

All the References of the World's Literature
--- from 1556 to December 31, 1933 ---

Review from **"Staub"**, (Dust), 1, No. 1:167-168, April, 1936, done by Dr. Ing. O. M. Faber, Berlin.

No. 115. Bibliography and Laws upon Silicosis. **(The Pneumonoconioses (Silicosis) Bibliography and Laws),** by Geo. G. Davis, E. M. Salmonsen and J. L. Earlywine, published by **Industrial Medicine,** Chicago, Ill., 1934, 482 pp. ($7.50).

The **Forword** is by E. R. Le Count, Chief of the Department of Pathology, The University of Chicago. The book has two main divisions. Part I is a Bibliography of the collected literature of the world upon the **Pneumonoconioses (Silicosis).** Beginning with the **De Re Metallica** of Agricola (1556), it ends with 1933, inclusive of 2,768 sources, whose title, author and exact citation are given. The works are chronologically arranged. Through subdivision into different groups, the works of authors appearing in the same year are clearly and immediately perceived. Within the groups the works are still arranged in alphabetical sequence by authors. These 276 pages of comprehensive bibliography are followed by a complete **author—**and **subject—index.** Besides, the location (orientation) of any expert treatise and the year of its appearance are easily made out at a glance.



In Part II, the Laws of the several States of the Union in North America, as relating to Occupational Diseases, the injuries they cause, and any pertinent material, are all represented. The plan and sub-divisions by which the situation can be ascertained for any one of the 48 states of the United States of America, are readily apprehended. In several cases corresponding paragraphs have cross-references. Especially valuable and complete is this legal survey for ascertaining any characteristic verdict (judgment) in respect of a pneumonoconiosis, showing the basis of the action, the conditions giving rise to the action, as well as the principle involved in the decision—for any state in the Union. The book closes with an alphabetical summary of the enterprises concerned in the juridical distinctions (or decisions.)

Examination of the book compels recognition of the extraordinary care and pains taken by the compilers. Random tests here and there show that for a space of 377 years this bibliography has attained a completeness not hitherto arrived at. Probably no branch of any other science has at its disposal so flawless and richly extensive a bibliography. It is authoritative not only for physicians and industrial experts, but also for physicists, engineers, and employers of industry. The format is entirely appropriate; for the arduous work involved the compilers should receive the fullest recognition.

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CHICAGO MEDICAL PRESS
(NOT INC.)
302 South Canal Street,
Chicago, Illinois

This magazine is published to promote sound thought upon and concerning industrial medicine and traumatic surgery. To that end it will contain articles, news items, reports, digests and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited.

Industrial Medicine

Reg. U. S. Pat. Off.

The editors will exercise care in checking on the accuracy of data printed, but in all other respects articles and opinions of which expression is allowed are the opinions of their authors—the editors reserving in all cases the right to comment on the same, in the current or any subsequent issues, as they may be inclined.

The Journal of Traumatic Surgery and Occupational Diseases

The Law, the Science and the Economics of Industrial Health

Volume 5 DECEMBER, 1936 Number 12

Chronic Intestinal Obstruction

—*Due to Lesions of the Large Bowel*—

by

VERNON C. DAVID, M.D., F.A.C.S.,
Professor of Surgery,
Rush Medical College,
Chicago, Illinois

SUBACUTE or chronic obstruction of the colon is more commonly observed than acute obstruction of the colon due to the relative frequency of lesions occurring in the large bowel which are slowly progressive and therefore obstruct the bowel gradually.* Cancer of the colon stands first as a causative factor, with diverticulitis, ulcerative colitis appearing as occasional factors. More rarely occurring lesions causing obstruction are acquired and congenital strictures of the rectum, Hirschsprung's disease, chronic granulomatous lesions, endometriosis and benign polypoid tumors of the colon.

Acute obstruction of the colon develops when any of the above factors completely occludes the bowel or in uncommon conditions, such as congenital atresia of the rectum, volvulus of redundant sigmoid or cecum, intussusception of a polypoid or cancerous tumor of the transverse colon or sigmoid, or strangulation of the colon in a sliding hernia or diaphragmatic hernia.

Paralytic ileus from peritonitis affecting both the small and large bowel is perhaps in a category peculiar to itself.

The clinical picture of large bowel obstruction varies considerably from ileus of the small bowel in that the symptoms of obstruction develop slowly and that distension is more pronounced and diffuse while vomiting appears later, is less violent and only becomes fecal when the small bowel eventually becomes dilated. These facts are well demonstrated when purposeful obstruction of the large bowel is produced surgically, as in the formation of an end-colostomy which is kept closed for several days. When this surgical procedure has been carried out in a pre-operatively well deflated and emptied bowel, the patient rarely has symptoms during the first 24 hours. On the second day slight distention and cramps develop from hyperperistalsis, but usually not until the third day does the patient become greatly distended and begin to hiccough or vomit. This purposeful complete obstruction of the colon acts much differently if performed on a bowel already partially obstructed and containing an excess of feces and gas, for, under such conditions, there is a stormy development of distention, vomiting and toxemia. It is also obvious that the nearer the obstruction is to the cecum the more the picture resembles small bowel obstruction.

In chronic obstruction of the colon due to cancer the symptoms may be so slight as to escape the notice of any but an alert patient. Trifling change of bowel habits, with slight constipation or occasional diarrhea, more gas formation with gurgling or occasional bleeding or abdominal cramps, may be the only symptoms at the onset. A little later chronic distention of the colon may be seen in a flat x-ray plate of the abdomen revealing the haustrated dilated colon. Due to repeated effort on the part of the musculature of the colon to push bowel contents past an obstruction the bowel wall may become greatly hypertrophied. Listening to the peristaltic sounds with a stethoscope on the abdominal wall may call the examining physician's attention to the hyperperistalsis and to its point of greatest intensity. Peristaltic waves may also be visible through a thin abdominal wall. In the continuing development of this chronic obstruction the large bowel above the lesion may become four to six inches in diameter and contain enormous amounts of feces without actually being acutely obstructed and the patient may eat and drink with only occasional vomiting. Eventually the small bowel shares in the distention, and complete obstruction may supervene. If the cancer of the colon develops in the normally narrowed portions of the bowel, as the rectosigmoid and flexures of the colon, the symptoms of obstruction develop easily and more acutely, whereas cancer developing in the ampulla of the rectum and cecum may exist for months without any symptoms of obstruction. It usually requires a year for a cancer of the ampulla of the rectum to completely encircle the bowel. Where chronic obstruction of the large bowel from cancer is suspected, it is very important in arriving at a diagnosis, to avoid filling the colon with barium *above* the obstruction or of giving barium by mouth, either of which procedures may convert a partial obstruction into a complete one. Careful administration of an enema of barium

* REPUBLISHED from *Surgery, Gynecology & Obstetrics* by special permission; Presented before the Congress of Railway Surgeons: Meeting of the Chicago, Milwaukee, St. Paul & Pacific Railroad Surgical Association, Chicago, November 5, 1936.

will indicate the point of obstruction and will show the sharp hook-like defect in the bowel.

WHEN the point of obstruction is localized the problem then to consider is how to deflate and empty the bowel above the obstruction so that an operation for the removal of the growth may be carried out without preliminary colostomy. This may frequently be accomplished by administration of a non-residue diet, repeated and slowly given warm saline enemas, heat to the abdomen and mineral oil by mouth. If distention and cramps continue or a flat x-ray plate of the abdomen shows a dilated gas-filled colon, it is then much safer to carry out a preliminary operation for decompression of the bowel above the obstructing lesion. If the growth is at the rectosigmoid we prefer to make a transverse colon colostomy so that the radical removal of the growth at another time will not be complicated by a fecal fistula in or near the operative field. If the growth is in the descending colon or splenic flexure, a colostomy is made on the left side of the abdomen in the transverse colon near the hepatic flexure. If the growth is in the transverse colon or hepatic flexure, a cecostomy is performed, but if the growth is in the cecum it is usually better to make a side-to-side anastomosis of the terminal ileum and transverse colon as this will act as a preliminary stage in the secondary removal of the right half of the colon at another time. When the growth lies in the cecum, transverse colon, splenic flexure, descending colon, or proximal point of the sigmoid and the obstruction is slight, it is good policy to examine the liver at the time of the decompression operation. If it contains carcinoma or the growth is inoperable due to local spread, a side-tracking operation may then be done anastomosing, for example, the transverse colon to the sigmoid in an inoperable cancer of the splenic flexure. Under no circumstances should a radical operation for removal of cancer of the rectum or colon be carried out in even a slight degree of obstruction, as peritonitis develops easily and more frequently. Even side-tracking operations are not advisable in any considerable degree of obstruction.

In acute obstruction of the colon with marked distention and feces-loaded bowel it is usually the safest procedure to avoid exploration of the abdomen and to place a Pezzar catheter into the cecum through a muscle-splitting incision. A portion of the cecum is delivered through the wound, which is then closed about it, the edges of the wound are protected by vaseline or zinc oxide gauze, and the catheter is then inserted into the bowel and a purse-string suture closes the bowel about it. The end of the catheter is led into a bottle outside of the operative field.

ALL OF the symptoms of chronic obstruction of the bowel may be present in diverticulitis of the sigmoid loop where spasm of the bowel results in distention, irregularity of bowel habits and cramp-like pains. These symptoms usually come in attacks and may be alleviated by proper diet, heat to the abdomen and administrations of tincture of belladonna. If the inflammation of numerous diverticula becomes pronounced a diffuse inflammation of the bowel results, with consequent fibrosis of the bowel and organic narrowing. This is not of common occurrence but is occasionally seen affecting the region of the rectosigmoid or, more rarely, the whole sigmoid loop and descending colon. Over a period of months definite and progressive symptoms of obstruction develop and it becomes necessary to do a temporary colostomy in the transverse colon to put the affected loop of bowel at rest. After an interval of six months to a year the colostomy may be closed, if by fluoroscopic examination the affected bowel is seen to return to a relatively normal pattern. Rarely should a resection of the affected bowel be resorted to.

Severe ulcerative colitis of the idiopathic type commonly deforms the bowel by markedly foreshortening it, so that the splenic and hepatic flexure are lost, and at the same time materially constricts the lumen of the bowel by contraction of scar tissue in nature's effort to heal the process. This may result in unyielding strictures of an annular or tubular character which produce all the symptoms of chronic large bowel obstruction. This condition, sad to say, is best treated by a permanent ileostomy.

Acquired strictures of the rectum due to advanced lymphogranuloma inguinale not infrequently lead to chronic bowel obstruction by reason of tubulation of the entire rectum up to the rectosigmoid junction. The process may go on to complete obliteration of the bowel. This obstruction is best treated by a permanent left-sided colostomy, as the process is almost always limited to the rectum.

AN UNUSUAL and often unrecognized cause of chronic obstruction of the colon is due to congenital stricture of the rectum. In embryonic life the descending mesenteron or hind gut meets the infolding cutaneous proctodeum and a membrane at the site of their union at the mucocutaneous line of the rectum usually disappears. In the cases under consideration, the membrane persists in part so that a diaphragm with a two to four millimeter opening in the center or a half-moon sickle-shaped diaphragm persists which greatly interferes with the passage of bowel contents. This results in intestinal stasis with distention of the colon with feces and gas and the symptoms of chronic obstruction of the bowel. If the condition is not recognized in infancy or childhood it may persist into adult life with resultant persistent partial obstruction. In childhood we have reported several instances of megacolon from this cause where the whole abdomen was filled with an enormous feces-loaded large bowel. In infancy or childhood these diaphragmatic strictures can usually be broken down by dilatation, but if not, a longitudinal division and a transverse suture can be accomplished and the narrowing overcome. In adult life some such plastic operation is always necessary.

The most dangerous and difficult type of ileus to treat is the paralytic type, which affects both the large and small bowel. The problem concerns itself with the cessation of the normal motions of the bowel and the absorption of toxic products from the lumen of the bowel. The vagus motor and intrinsic motor mechanism of Meissner and Auerbach are easily put out of action by the inhibitory nerves of the splanchnic flexus. Experimental irritation of the peritoneum in animals by injection of weak iodine or turpentine solutions results in a

reflex inhibition of bowel motions by stimulation of the splanchnic nerves that may last two to three days. If the splanchnic inhibitory nerves are paralyzed in such an experiment by lumbar or spinal anesthesia, bowel function is usually restored at once. If we regard the matter clinically, we appreciate that prolonged intraperitoneal surgical procedures or the irritation of the peritoneum by infection results at once in a reflex inhibition of intestinal motions. This results in distention and accumulation of fluid in the bowel which may be absorbed into the circulation and cause toxic symptoms. If peritonitis is present, the inflamed loops of bowel continue to be inactive by reason of direct damage of the motor nerves in the bowel wall. This causes distention and absorption of toxic products and the bowel contents begin to back up into the stomach. The effect of inflammation of a loop of bowel on abolishing motion in it can be shown experimentally and clinically. The clinical performance of a colostomy or ileostomy has a striking effect on the intestinal motion in the loop brought out on the abdomen. In 24 hours such a loop of bowel is distended, thickened and covered with fibrin. It can be pinched, touched with a cautery, or stimulated with an electrode without producing peristaltic motion in most instances. However, as weeks go by the extruded bowel loses its inflammation and appears normal and peristaltic motions return. It therefore seems reasonable to assume that in paralytic ileus from peritonitis we have loops of bowels in which paralysis has occurred both by reflex inhibition of motion and by reason of direct damage by inflammation of the motor nerve endings in the bowel wall—this resulting in distention, stasis and absorption of toxic intestinal contents. The rational treatment of paralytic ileus from peritonitis then becomes symptomatic in that we must decompress the bowel as much as possible by keeping the stomach empty by the admirable apparatus described by Dr. Wangensteen, and at the same time replace into the circulation an adequate amount of salt solution by venocylosis and subcutaneous injection. Morphine by hypodermic stimulates peristalsis if the bowel is not too badly damaged. The outcome, under such conditons, depends very largely on the continuity and severity of the peritoneal infection. If no open source of contamination of the peritoneum exists and the process tends to limit itself, many of these patients will gradually recover and peritoneal peristalsis will again be re-established.

Discussion:

DR. T. W. NUZUM, Janesville, Wis.: This paper has been so thorough and extensive that it does not leave very much new for one to add. With your consent, I will go over a little of our experience in cases which my late lamented colleague, Dr. J. F. Pember, and I had during our association of 20 years.

The onset of severe toxemia is more gradual in the large intestine than in the small bowel. Tumor formation is present and is rarely due to hernia or adhesions. It may be congenital as in imperforate anus, congenital narrowing of the bowel and megacolon, or caused by carcinoma, volvulus of the cecum or sigmoid, diverticulitis of sigmoid, adhesions, congenital or operative, fecal impaction, and intussusception, and intestinal stasis.

In malignant tumors the symptoms noted are change in bowel habit, as constipation and diarrhea, or acute obstruction with passage of blood and mucus. When low down the tumor can be felt by digital examination, or when higher may be seen through the proctoscope. or when still higher in the intestine may be demonstrated by the barium meal and x-ray.

Sarcoma of the intestine is not common, but when present the prognosis is very bad.

The treatment of carcinoma of the colon is always surgical. The operation may be done in one or multiple stages, as conditions require. When carcinoma is situated in the rectal sigmoid, a permanent colostomy is indicated, but when located in the region of the cecum resection is the operation of choice. These cases are usually far advanced before diagnosed.

Intussusception usually occurs in children. One can generally feel a sausage-shaped tumor, which may be reduced when operation is done early. We have met with two in adults; one was due to a polypus; the other patient died without operation and a postmortem was refused.

Volvulus of the large intestine most often involves the sigmoid. Pain is the predominant symptom. Vomiting is rare, though it may occur late in the course of the disease. Operation should be done early. The three steps in the operation are untwisting the volvulus, plastic procedure to prevent recurrence, and resection where the bowel has become gangrenous.

In tuberculosis of the large intestine, the cecum and ascending colon are most often involved. Where ulceration has taken place, mucus, pus and blood are found in the stools, and a mass can be felt in the right iliac region. Medical treatment and diet are usually adopted. In the hyperplastic type, surgery may be required.

Actinomycosis most often affects the cecum and sigmoid; it runs a chronic course and may give rise to infection. Usually a mass can be palpated, and sinus and fistulae may be present. The ray fungus is found in the discharge.

Diverticula of the intestine may be single or multiple, and may become inflamed. We had one patient with diverticulitis and abscess of the colon. There were a number of diverticula. By drainage we succeeded in relieving him, and he recovered.

Benign stricture of the rectum is due to many different causes. I had one patient with a very great constriction following a Whitehead operation for hemorrhoids performed by Dr. Whitehead himself. The bowel was so constricted that it was necessary to pass a sound to permit the passage of feces. The man did not survive.

Other causes are gonorrhea, ulcerative proctitis, tuberculosis, foreign body, as a gallstone, and hole in the mesentery. A patient was brought to us suffering from obstruction of the bowel. At operation we found a gallstone as large as a hen's egg that had ruptured through from the gall bladder into the intestine and had gotten into the ileocecal valve. We removed the stone but the patient died. That stone was made up of thousands of little stones agglutinated together. I saw another case in which the bowel had slipped through a hole in the mesentery and produced obstruction. Operation was performed and the patient recovered.

When obstruction results from benign stricture of the rectum, massive resection is likely to be required. Early diagnosis and immediate operation will reduce the mortality. Dr. T. S. Cullen, of Baltimore, reports the case of a boy, 11 years old, with a hole in the mesentery of the ascending colon, who lost five feet of small intestine and recovered. Multiple stage operation is the safer in many cases. Where the rectosigmoid is involved, a permanent colostomy is essential. When the cecum is involved, resection is the operation of choice.

I will cite two or three cases which illustrate some of the points I have made:

The first is that of W. C., a merchant, age 67 years. Nine months previous to admission he began to lose flesh and strength, suffered from sore tongue, the skin took on a lemon hue, and the blood picture was quite typical of pernicious anemia. He was constipated, but suffered from diarrhea at times. The urine was negative. There was no edema, and no tenderness over the gall bladder. The local findings of spleen, liver and kidneys were quite negative. Hydrochloric acid was present in the stomach contents, which is not classical in pernicious anemia. He received six blood transfusions, after which the blood picture markedly improved, the hemoglobin increasing from 60 to 85%, and the red cells from 280,000 to 4,800,000. He also gained in strength and well being.

Some months later he suffered from an attack which was diagnosed as appendicitis. He soon improved, but a small mass was palpable in the right iliac region. Shortly after occult blood was found in the stools; this was still present after a meat-free diet. The mass became larger and was somewhat tender to pressure and movable. After careful x-ray, blood and physical examination, carcinoma of the cecum was diagnosed and an operation advised and

accepted. A right rectus incision was made and a carcinoma of the cecum as large as one's fist was found. The mesocecum was short and a loop of the transverse colon was attached to and infiltrated by the cancer mass which made it imperative to remove a portion of the ileum, the cecum, ascending and transverse colon. A side-to-side anastomosis of the ileum and descending colon was made after closing the end of the colon and ileum; chromic catgut was used and a catheter inserted in the ileum eight inches from the point of anastomosis sutured in same, and the gut sutured over it, thus burying the catheter in a furrow in the small intestine for four inches, and the small intestine was fastened to the peritoneum at the point where the catheter was brought out through the abdominal wall. This gave vent to gas and enabled us to introduce normal saline and liquid nourishment directly into the small intestine. There was no vomiting nor distention following operation and no anodynes were required. The patient made a fine recovery. The catheter in the intestine contributed very much to his comfort and undoubtedly added much to his chance. The specimen showed a cancer mass with ulcerated and bleeding nodules inside, which involved the entire cecum and a portion of the transverse colon, which had dropped down and become adherent. The finger could be passed through the most constricted portion; hence the absence of obstruction to any marked degree.

The interesting thing in this case was the difficulty in making a differential diagnosis between secondary anemia, malignancy and pernicious anemia, a few points concerning which we wish to emphasize.

It is quite generally agreed that hydrochloric acid is absent from the stomach in pernicious anemia; but this may occur in achylia from other causes, such as nervous dyspepsia, and mental or physical exhaustion. Occult blood when found in the stools should lead one to search for its cause by a careful microscopic study of the stools and a careful proctoscopic examination of the rectum and lower bowel; thus may be revealed the presence of ulceration, parasites, etc., or the presence of annular carcinoma of the colon or small intestine; one case of the latter I have seen, where hemorrhage was not taking place.

This patient made a fine recovery for two years. Later I was called to see him, found him intensely jaundiced. His liver extended one hand's breadth below the margin of the ribs and was extremely nodular. He died soon after of cancer of the liver.

Another lesion of the large bowel which deserves mention is megacolon or Hirschsprung's disease. It is an enormous dilatation of the greater part or all of the colon, with marked thickening of the walls and with no discoverable cause. The condition was first described by Hirschsprung in 1886, although Billard and Barry 60 years before had reported instances of "enormously distended colons with no apparent obstruction."

A case in point is that of an undersized frail child with an enormously large abdomen and the lower ribs markedly flaring. Her condition did not admit of much delay and she was submitted to operation. Under ether anesthesia a median abdominal incision was made. A greatly distended viscus presented, which was at first taken for the stomach, but upon further study it was found to be the colon, although it had quite lost the characteristic markings of that organ. The wall of the gut was very thick, the white lines had disappeared, and it had the feel more of leather than living intestine. It was some six inches in diameter and extended from the hepatic flexure downward, increasing in diameter until within two and one-half inches of the anus, where it suddenly became the size of a normal gut. The sigmoid, which was the largest portion, was so crowded into the pelvis that it kinked, thus causing the obstruction. The mesentery was thick and edematous. The condition of the child did not warrant a formidable operation, and the mechanical difficulties connected with the attachment of the small intestine to the short bit of a rectum would have been great. We, therefore, determined to carry the sigmoid across to the cecal region, attaching it to the abdominal wall, thus carrying it out of the pelvis and relieving the kink. Whether the relief she has obtained from drawing the bowel out of the pelvis and fixing it on the abdominal wall will be permanent remains to be seen. If relief is not permanent one of the radical procedures can be undertaken.

Megacolon may well be divided into two distinct types the etiology of which is markedly different. First, the congenital type, such as the above case, which is the true Hirschsprung's disease; second, the type often met with, due to obstruction of the colon more or less long continued, where the cecum or some part of the colon has become greatly distended until it forms a tumor which quite fills the abdominal cavity and is full of liquid feces. These are found in older subjects, are caused by long continued obstruction and lead to a speedily fatal termination unless relieved by surgical measures. I will cite two cases in point.

Miss S., age 24 years, a clerk, was taken ill with what was diagnosed as appendicitis and treated by the Ochsner method for some 10 days, when an operation was advised and accepted. Upon opening the abdomen a large tumor presented which quite filled the abdominal cavity. This proved to be the secum and ascending colon. There was a band of adhesions constricting the transverse colon beyond which the intestine was empty. The band of adhesions was divided and the liquid feces began to pass along. Miss S. recovered after a stormy convalescence.

The second patient, Mrs. M., age 65 years, had suffered from constipation for some time and had used laxatives quite regularly until she embraced the Christian Science faith, after which she threw aside the physic. Her home was in Minneapolis. While visiting friends in Janesville she became ill. I was called to see her at a healer's home and found an elderly lady with greatly distended abdomen, vomiting fecal matter. The history obtained was that she had had no bowel movement for more than two weeks; she had continued eating heartily in the meantime, and for the past week had been under treatment by the healer. She was removed to the hospital, refused operation, and died at the end of three weeks, still strong in the faith. Postmortem revealed an annular carcinoma of the sigmoid and above this the colon dilated into a tumor larger than an adult head and full of liquid feces. One would scarcely believe the colon capable of being so distended as was the case in these two patients, but they lacked the thick wall and leathery feel that the true megacolon exhibits.

The rarity of Hirschsprung's disease makes the proper diagnosis less likely. It may be treated with some success by enemas and massage. A cure requires surgical measures which may consist of (a) resection of the colon and anastomosis of the proximal end to the rectum; (b) making a colostomy and later resecting the diseased portion; (c) correcting the position of the colon, thus relieving the kink and attaching the same to the abdominal wall after introducing a tube through which to treat the colon. The latter is a safe procedure where the condition of the patient is bad, and paves the way for resection later should it become necessary or advisable. Adson, of the Mayo Clinic, reports 11 cases operated by sympathectomy, removing the sympathetic ganglia and nerves. He considers the results better than in any other form of treatment.

Periarticular Fibrosis

By DONALD GORDON, M.D.,
New York City

THE subject I am presenting has to do with a problem which, I am sure, most of you have encountered in your surgical experience.* The functional defect which it presents when it is fully developed is a large problem, for the reason that it is difficult for the patient to understand why he should not have full function of his hand or foot after he has recovered from the original injury or infection.

The intractibility of this condition places a conscientious surgeon in a most trying position, unless he is aware that such a condition can develop, and institutes early measures to prevent or minimize it as soon as possible after the case comes under his observation, and impresses upon the patient the certitude of what will happen if he does not cooperate.

This condition I have described as "Post Traumatic Periarticular Fibrosis[1]. These terms were chosen because they present the nearest interpretation of the objective clinical picture which is

* Presented at the Thirteenth Annual Meeting of the Association of Surgeons of the New York Central System, Detroit, Michigan, October 13, 14, 15, 1936.

manifested by these cases. For many years an endeavor on my part to obtain gross and microscopic studies of the joint lesion has failed, as tissue for pathological examination from the hand is so difficult to obtain.

I have been studying this condition by careful clinical observation since 1914. At that time, in caring for a large number of ambulatory fracture cases in the Outpatient Department of the Roosevelt Hospital in New York, we were furnished a fertile field for observing loss of function in the hands of patients who had been treated for forearm, wrist, and hand fractures. Dr. Kirby Dwight and myself, studying these cases daily and discussing them at great length, came to the conclusion that the outstanding persistent objective factor which was present in a hand which subsequently lost its finesse of movement following a fracture or infection, was swelling distal to the primary lesion which had not been effectively controlled. Later I studied the relation of disability in the foot following fractures of the leg where swelling had not been prevented, and came to the conclusion that a similar lesion would develop in the foot where uncontrolled swelling had been permitted.

Post-traumatic periarticular fibrosis, as I described it, is a condition which occurs in a hand or foot following the swelling due to trauma, (physical or infection) proximal to it on the limb. It is characterized by varying degrees of functional loss of the distal joints of the limb especially in the hand, and is associated with pain on movement of these due to an overgrowth of fibrous connective tissues about the joints and in the tissues which normally permit their function. It is accompanied by decalcification of the related bony structures. This is the clinical picture which gave birth to the name of the lesion I described.

Contemporary with the publication of a paper describing this condition, which I read before the New York Surgical Society in 1934[1], Gurd, of Montreal, published a paper calling attention to the post-traumatic acute bone atrophy[2] following fractures, and more recently has again written regarding Sudeck's "bone atrophy"[3] as being the background for the onset and cause of the lesion described by him, and which is so similar that we may be discussing the same thing.

The picture that had originally attracted my attention was one of lost function due to fibrosis of periarticular tissues. Although we had seen bone changes in the roentgenograms, we felt that this was a natural sequence of whatever caused the primary swelling and ultimate changes in the other tissues.

In reading the literature given in the bibliography of Gurd's paper, it became apparent that the many papers written since Sudeck's original paper in 1900[4], have been based on the latter's early description, in which he emphasized the term "bone atrophy." It seems likely to me now that the lesion I described might be what Sudeck called "acute inflammatory atrophy of the bone" in his excellent article in 1900. Most of the literature dealing with the lesion since Sudeck's description, has only emphasized bone atrophy and focused attention on that part of the picture, rather than the cause of the disabling joint process. Almost every article contained illustrations of the x-ray changes, and gave lengthy histopathological descriptions of the bone process. The functional disturbance of the joints is well depicted, but there is a remarkable paucity of the pathology of the periarticular and associated structures which, I believe, is the more important part of the picture from a clinical standpoint.

In my observations I have been so impressed with the loss of function due I believe to fibrosis that, in reviewing the literature for my original paper, I sought for an explanation for the overgrowth of connective tissue. I considered the bone changes as incidental and did not look for "bone atrophy" as a cause for the loss of function. I was surprised therefore in subsequently reviewing the literature to find a similar condition described under "acute bone atrophy." The papers dealing with the latter subject have not answered my question however, as to why a periarticular fibrosis develops, and if it does, how it might be prevented.

Though I committed this error and might readily be accused of plagiarism, I can assure you I was sublimely ignorant of Sudeck's work. I am still not intrigued by other than the cause and prevention of the periarticular lesion. I believe if that can be prevented, bone atrophy will not occur. If bone atrophy exists, it will continue until the improvement in the process which fixes the phalangeal joints permits a return to normal function, or to such a degree as may represent the end of Nature's reparative effort.

Fontaine and Herrmann[5] show photographs of bone changes in a case of nine months' duration, regarding which they state that "the bones of the right hand show extensive and marked osteoporosis compared with the normal one . . . The histological preparations show fewer and thinner bone lamellae in the bones of the right, the affected one." The process of osteoporosis in this case appeared to be one of pure osteolysis.

The consensus of opinion is that the atrophy shown in the roentgenograms is not uniform, giving the "spotty atrophy" appearance which Sudeck called attention to, and a constant thinning of the cortex of the affected bones. I have never had a roentgenologist mention "spotty atrophy" in the cases I have studied. They have spoken of decalcification only, and in pronounced cases a narrowing of the joint spaces.

MY CONCEPT of the inception of the lesion is that, following an injury or infection of a limb, swelling occurs distal to it. The swelling is a venous engorgement with hyperemia of moderate degree. This is accompanied by a lymph stasis which soon supervenes and the vascular content of the subcutaneous tissues appears to be less than normal. Then an overgrowth of connective tissue takes place in the relatively avascular periarticular tissues—function is limited, and pain occurs on movement. The pain initiates a protective spasm of the muscles moving these joints which goes on to contracture of the muscles. Atrophy of all parts naturally follows, and a vicious cycle is instituted.

Sudeck's original articles does not furnish much light as to the possible cause of the condition he described, nor has the literature since his paper clarified the subject. I think this may be accounted for on the basis that when Sudeck was studying his cases, he found the developed lesions quite intractible, as they still are. He naturally turned

to the recently discovered x-ray to see what it might show. The outstanding and striking picture was the bone changes, which naturally were impressive with this new laboratory method. Since his paper, all writers have continued to concentrate on the roentgenographic appearances of the bones and seek for the cause and prevention of them.

In the condition I am interested in, the bone is not affected until after the inception and establishment of a certain degree of loss of function in the soft tissues and joints. I believe that the choosing of the bone changes for study has made the whole subject exceedingly difficult for those interested in this condition, especially so when the obvious symptoms in the soft parts which are so striking are well established before roentgenograms will show that the bone is affected.

Scrutiny of the case reports in the literature reveals that the roentgenograms are largely of cases which have existed for several weeks. My experience unbiased by any background of knowledge of acute bone atrophy, led me to seek for a cause of the loss of function and pain in the joints, obviously due to a periarticular lesion.

The decalcification in the bone, I felt and still believe, was produced by and followed whatever caused the reactions in the soft tissues, and that, by preventing the objective and subjective symptoms in these, the condition as a whole might be avoided or mitigated in those prone to develop it. The literature studied does not appear to show any appreciation of the very early aspects of acute bone atrophy, nor a sufficient attempt to anticipate and prevent the condition. It is suggestive that all measures mentioned for the cure or prevention of acute bone atrophy from Sudeck's paper to the present, would primarily act through the changes in the soft tissues, function of the articulations, blood vessels, and lymphatics.

The various theories are based upon two types of study—clinical observations on the developed bone lesions in patients, and animal experimentations endeavoring to reproduce these lesions. Persistent hyperemia, advanced by some, leaves much unexplained.

Fontaine and Herrmann[5] who are adherents of this idea are unable to explain how a sympathectomy will relieve a hyperemic process, if it does, more than temporarily. Allison and Brooks[6] cite cases of acute proximal vascular obliteration without its production. Grey and Carr[7] excluded the sensory nerves, but stated injury to the motor nerves gives a certain amount of atrophy, which I would expect. They found that local congestion and anemia from arterial occlusion, except in extreme degrees, did not occasion bone atrophy. Their experiments done on animals furnished no clue to the cause of the lesion itself.

The neurotrophic theory with functional disturbance due to injury of the sympathetics is advanced by others. It has not been found adequate to explain a cause for the condition.

Kanavel[8] describes in his book on hand infections "three types of edema". The second type which he calls "hard edema" is characteristic of what I believe causes marked loss of function in terminal joints due to pain and fibrosis. He states "the hand is white and warm, not blue and cold"—pain is severe with no evidence of venous engorgement or phlebitis. Arterial oscillations are often intensified, or may be normal. He quotes Tinel and Moncany as believing that the circulatory obstruction is to be found in the capillary and venous system, and the serous exudate occurs from the arterioles. I believe that such an edema causes very quickly a progressive loss of joint function by distention and pain, and if prolonged, a periarticular fibrosis.

There has been little effort in the adherents of Sudeck's theory to explain the overproduction of fibrous connective tissue so obvious in the soft parts and periarticular tissues.

IN MY original paper[1] I called attention to Adami's theory of connective tissue overgrowth following lymphatic obstruction, and Homans'[9] more recent work in which he speaks of the overgrowth of connective tissue in limbs which have been subjected to lymphatic obstruction and infection associated with venous stasis in phlegmasia alba dolens.

In studying our problem I was impressed with the fact that the nearer the proximal and primary injury was to the trunk of the body, the less tendency there was for the lesion in the hand or foot to develop. One must make a distinction between the lesions in question and the fibrosis which takes place about any joint in the body associated with injury and nearby swelling, though an analogous etiology is difficult to exclude. When the primary lesion is near the trunk, there is usually an adequate collateral circulation of blood and lymph distal to it, which prevents the development of the same degree of lesion that occurs in the end of an extremity; as in the latter case swelling must soon interfere with all direct and collateral capillary circulation in the tissues where the loss of function takes place, because there is no possibility of a distal collateral circulation.

The combination of the above with the factors which make for atrophy of disuse might produce a lesion in an extremity which I think should closely resemble Sudeck's type of bone change. It is on this theory that I believe that, by preventing swelling and maintaining adequate circulation in the end of a limb, this disabling condition of hands and feet, whatever one chooses to call it, may be avoided or lessened.

Etiologically it is rarely seen below the age of 30. Above this, as age increases, it is more frequent. In my experience I have found it more common in females, and I have felt that it developed more easily in the female type which had stigmata of endocrine disturbance. It does not occur in children's hands or feet unless it is part of the generalized fibrosis of Volkmann's ischemia. It may be that the greater vascularity of the tissues of growing children prevents its development at this age.

It does not occur without injury or infection proximal to it on a limb or lateral to it when near the extremity's end. A relatively minor injury or infection that causes much swelling will produce it. The greater and longer the swelling exists, distal to the proximal lesions, the more certain is the production of the functional loss, lengthening the period for recovery, and increasing the chances for a definite permanent disability.

In a case where infection is prolonged and swelling develops insidiously until there is obviously a poor circulation in the extremity, it will develop

without one being conscious what this portends. I do not ever remember seeing it develop where there had been no swelling in the distal part of the limb. Although swelling occurs in this region which does not produce it, inadequate splinting and elevation in fractures and infections predispose to it.

There is every degree between the mild and the advanced type of the lesion with the degree of pain of function proportionate to the severity of the process. At the stage of swelling, this pain is not marked; but as the generalized swelling subsides and leaves the enlargement about the joints, pain becomes prominent. Later the enlargement is not so marked as is the pain of movement. If complete fixation occurs in the joints, pain then stops. The cause of the pain I believe is not due to a neuritis with its pathological changes, but due to the changes in the spatial relationship of the terminal sensory nerve endings[1] about the joint, when they are pressed upon by the increased pressure of the fibrous tissue upon extremes of movement. These joints are subject to weather change discomfort. I do not believe that the fibrosis is confined to the periarticular tissue, capsule, and joint ligaments alone; but consider there is a lesser involvement of all the soft tissues which of necessity have to move on each other when a joint activates.

THE clinical picture usually presented in the hand is as follows: A patient is treated for an injury or infection of the finger, hand, wrist, or forearm. The hand becomes swollen. This is greatly increased if there are constricting dressings. If all dressings are removed, and the hand is placed in a dependent position, as in a hot bath, the position alone causes it, provided the position is maintained without periods of elevation. A forearm in loosely applied splints for a fracture, unless held elevated, will develop the swelling and this in direct proportion to the degree of the proximal injury. The soft tissues of the fingers become distended with fluid. This fixes or splints the interphalangeal joints, as blowing up a collapsed rubber toy balloon causes it to become firm. When the swelling has attained this degree, the fingers are held in a slightly flexed position of repose, the joint wrinkles and palmar creases are absent; the skin has lost its normal appearance, is pale or slightly cyanotic, and cannot be pinched up, the palm and fingers may be slightly moist. There are no changes in the nails or eponychium. The edema is relatively a soft pitting one, and can be massaged out to a considerable degree. If this picture is allowed to continue for over a period of two weeks or longer; or where the severity of the proximal lesions has diverted attention from the swelling of the hand or foot and it is permitted to exist, the swelling may appear to be less, but of a more stubborn type with the tissue about the joints more prominent. The eponychium at this stage becomes flattened, pale, and extends out on the base of the nail. The nails have the appearance of being unused, as also the finger pads. The fingers taper from the knuckles to the tips and look more pointed with the joints more prominent. Active movements take place in the metacarpo-phalangeal joints rather than in the interphalangeals, and at first cannot even be started. The distal joints lose their function first, then the proximal ones, and lastly the metacarpo-phalangeal. As the development of the process progresses and matures, the degrees of function are always less in the distal joints. The pain is in inverse ratio, the less movement existing in the joints the more pain there will be upon moving them until they become fixed. Careful examination of each joint will show a few degrees of active and passive movement without pain; but to exceed this non-painful arc will produce pain in the joint proportionate to the extent that the joint is flexed. This is not due to the fixation of the tendons in their sheath by plastic exudate, as each joint shows varying degrees of movement. There is no pain or crepitus in the tendons, and unless the insertion of the tendons which are so closely related to the capsules be part of the picture, it appears to me that the tendons have little to do with it. Limitation of motion apparently is due largely to a periarticular productive process which is slightly tender on firm pressure and causes pain when extremes beyond non-painful arcs are exceeded. The process in severe cases may extend to the carpal or wrist joints.

Making due allowance for the difference in the anatomy of the foot, the loss of joint movement is not so graphic; but if one will visualize an analogous painful process in the joints of the feet, the discomfort of moving these joints in walking can be appreciated when these members have to support the body weight.

The roentgenographic bone changes which the x-ray reveals after these symptoms have been active for a period of four or five weeks have been reported as decalcification of the bone, narrowing of the joint spaces, and slight thickening of the soft parts around the articulations.

Differential diagnosis must exclude fixation of tendons either in an infected or adherent scar, or to adhesions in their sheaths. Acute exacerbation of a chronic arthritis, or the more rare Neisser infection must also be ruled out.

In cases of chronic arthritis, this condition due to injury may present itself and aggravate the former. In itself, it is a multiple arthritis and any case which has an arthritic background, should be carefully guarded against its development.

Volkmann's contracture may be readily determined as a muscle lesion; but the etiological factor which produces a Volkmann's pathology may produce the periarticular one; and the added difficulty of treating the regaining lost muscle action when joint function is absent, becomes obvious.

I am firmly convinced that this condition can be prevented to as large an extent as many of our so-called preventable diseases are prevented at the present day, by taking care that such swelling as might follow or accompany any trauma or infection of a limb is kept down to a minimum degree until the cause of the swelling has subsided. If this is done, muscular action will facilitate and tend to overcome capillary and lymph stasis. If the increased lymph pressure in the extremity is prevented, the capillary circulation is improved as can be demonstrated on any open granulating wound. Rings should be removed, or cut from the fingers. Dressings surrounding a limb should be neither constrictive nor applied so that they cannot be released sufficient and quickly to stop the onset of swelling due to them. Adequate cotton padding should be placed on splints, about and between dressings and bandages to permit a safety

factor against swelling and constriction. Fractures should be reduced to a satisfactory position at the earliest possible moment. Infections which are unlocalized should be given hot baths or local moist heat with elevation judiciously and energetically applied until the edema has subsided or the infection localized. Dressings should not be applied dry and afterwards wet, as the bandages shrink when moistened.

Adequate splinting of trauma or an infection avoids the spasm of muscle splintage, and promotes more comfortable voluntary activity of the fingers and toes. In reapplying splints which have been removed to permit massage for swelling, care should be taken to avoid rebandaging them as tightly as before removal.

The important feature is that the distal end and as much of the whole extremity as is possible, be maintained as high as possible above the level of the heart until all tendency to swelling has subsided. This obtains in either the sitting or supine position. Where this is not effective, gentle massage by a masseuse or the surgeon, with the dressings removed, must be used to combat the swelling of the fingers and toes.

An ambulatory patient with the elbow flexed and hand on chest above the heart is in an incorrect position, though in a better one than hanging down with the forearm horizontal. There should be frequent brief periods of respite during the day from these elevated positions to afford increased circulation for repair. The presence of finger and toe-joint creases and wrinkles at all times is imperative. If elevation does not afford this picture, the dressings are too tight and must be loosened as soon as possible, or there may exist increased tension from undrained infection. The surgeon who uses dressings which cannot be loosened without his personal attention should arrange to cope with this problem before it is too late. Non-padded splint plaster encasements fulfill this dictum for plaster dressings.

The apparently simple procedure of getting either an intern, nurse, or patient to understand the importance of carrying out directions for sufficient elevation is a most difficult and arduous task. They must be given specific illustrations as to the method, and this followed with daily, I might say hourly, observation until the patient can be made to understand what is wanted, what is effective, and what is not effective.

The persistence for only a few days of a very moderate degree of swelling will initiate the process, especially in a certain type of individual. I have no means of identifying this type, except that age is a predisposing factor. What can be prevented will not have to be treated; but once it is established, the outlook is one of prolonged convalescence lasting for months. My experience has been that most cases clear up, the severe cases being left with one or two ankylosed terminal phalanges. In the very painful prolonged cases a splint will give comfort between physiotherapy treatments. The case that is established should not have any massage which does not give an immediate beneficial reaction without pain. Passive movements by a masseuse or with the patient's free hand which cause pain are very bad and augment the condition. Moist heat or hot baths daily for 15 to 30 minutes with non-painful active movements are excellent. Elevation should be continued high and positive, so that when the limb is depressed to improve circulation, the blood may surge into the capillaries as in Buerger's exercises. Other physical measures I refer to the physiotherapist. When the process permits resisted movements, if these are used in the planes of lost motion, they will be a great aid to the restoration of function. Movements should be given after the hot baths.

The non-padded non-splint case as advocated by Boehler[10] when employed by one not experienced and trained in its application and use, is fraught with danger. The proper application, use, and supervision of it in leg cases which permit walking in suitable cases as a prevention and cure of bone atrophy, are based on the principle that the muscles are activated. Activating muscles prevents venous and lymph stasis. The fact that bone atrophy is prevented and cured by such a method is highly suggestive of the validity of some part of our opinion. However, if a limb be in a plaster cast, even as extensive as a Whitman spica, the muscles can be activated voluntarily to attempt the normal movements of each joint of that limb, though no visible motion will occur; yet the muscles will be activated sufficiently to prevent complete atrophy of disuse together with improved circulation.

The early removal of splints in fractures is about as bad as delayed removal. Splintage has been blamed for damage because the splint has been improperly used. It was not the splint, "it" was the way the splint was used.

Anything which can be done to avoid the inactivity of all tissues except those required to be placed at rest, prevents a certain degree of atrophy in them and preserves functional integrity. The only guide I can offer for this is, make the patient comfortable and fight swelling.

As Sudeck used Bier's hyperemia in the treatment of his cases, I believe this newer method should be tried as Hansson suggests for prevention in cases of persistent swelling distal to infection or fracture, and in the late established lesions in conjunction with those we have mentioned.

Occupational therapy properly directed in conjunction with such physical therapy as tends to aid in vascularization, is of the greatest aid. It affords recreational diversion while the patient is doing resisted movements. It helps the psychology incidental to convalescence from trauma, and with the satisfaction of accomplishment from doing work, traumatic neurosis is greatly diminished.

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Accidents from Physical Deficiencies

—*What Remedies May Be Applied to Minimize Them?*—

by

A. F. LECKLIDER, M.D.,
Personnel Director,
Fisher Body Division,
General Motors Corporation

MY TASK is to give an answer to "What can be done to minimize accidents due to physical defects?"* I am going to try to point out the opportunity that the present day modern conception of employee relations has given to safety departments and medical departments alike. New emphasis on the '*individual*' is opening the doors to a different and more effective approach to safety.

I will draw on my own experience to illustrate the evolution of the idea which I am presenting here. This was our problem 15 years ago:

We were a press plant, having, I understand, one of the largest press rooms in the world, with a producing capacity of metal for about 5,000 automobile bodies per day. We were crowded with machines and crowded with men. Sheet metal with sharp edges was piled high in many places. Aisles perforce were no wider than they should have been. Increasing demand on production from year to year kept our safety hazard ever active. New machinery, new processes and new plant additions prevented any stabilizing of conditions long enough to acquire 100% of safety performance.

We were also one of the largest wood mills in the world, with long lines of shapers, saws, and woodworking machinery. In those days the guarding of machines was not developed to the point that it has reached today. There was more opportunity for the inexperienced man or the careless man or the extremely hurried man to get into trouble. Our plant was working with all the difficulties attendant on a rapid growth. We added our men by hundreds in the beginning and in each succeeding year. We had in those days possibly less safety instruction than we have today. Our employees had worked largely in different occupations from those they entered when they came to us. We engaged young men, middle-aged men, truck drivers, salesmen, every kind of worker, to operate the machinery of our vast industry. We had, of course, also to supply the numerous occupations which go with assembling, trimming, and painting automobile bodies. And there was the maintenance of a large plant involving the handling of electric current, conveyor systems, and many power tools and heavy presses.

Some 12 years ago in this plant, employing at that time about 7,000 men, we began the physical examination of all *new* employees. At the end of the year, having examined some thousands of people, we undertook the examination of all *old* employees returning to work after a seasonal shut down. Our procedure was not lengthy, we were set up to examine probably 100 men a day by one examiner, but the main point is that we compiled records on our physical disabilities. So far as protection goes, our philosophy was that a good record was our best protection. The knowledge of an examination record in the file has a wholesome effect. Rejections were few, being largely pronounced deformities, less than useful vision in at least one eye, large hernias and contagious conditions. Our rejections were somewhat less than 3%, and a survey of the plant some years later, for example, showed that we had approximately 8% of our employees suffering from hernia. As a matter of fact, we found that we had practically drawn the line only at communicable diseases and outright accident hazards. Naturally, later on, recurrent examinations were undertaken, and more attention was paid to individual health factors, and, except for our returning old employees, the standard of acceptance was slightly raised. Signs posted in the employment office and examination room read: "This examination is made not for the purpose of rejecting applicants, but for the proper placement of those whose defects might be hazardous to themselves or those about them."

After a season of collecting our physical examination records we began to try to put two and two together by taking the histories of our accident cases and checking them with the findings of our physical examinations. Somewhat to my surprise, I was not able to find very many cases in which a man with a deformed elbow, for instance, had lost a couple of fingers in a shaper after going to work on that machine, nor very many cases where 20/40 vision had contributed toward a "kick-back" in the mill. Our physical examinations most often were completely negative in our worst accident cases. I checked my findings with some other examiners with more or less similar results. One might have inferred at this time that there would have been a considerable question in my mind as to the elimination of such a time consuming and laborious procedure as performing physical examinations on large numbers of men. If many of the men whom you knew to have disabilities were able to keep out of trouble and accidents did happen to some men without discernible defects, there might seem to be little reason for subjecting them and myself to the discomfort involved. Some more analysis of cause and effect, therefore, seemed desirable and necessary. It did not seem that simple combinations of unfortunate circumstances, or some oversight in mechanical safeguarding, could constitute the sole contributing factors to an accident rate which we felt to be excessive.

And accidents did, of course, occur. I looked at these cases with much concern, endeavoring to tie them in with some factor or physical defect in the man himself. There were, it is true, a considerable number of accidents in which a combination of circumstances tended to fasten attention on the physical defects which we had found, and to these, I think, we tended to attach too much weight. However, more often I was impressed with the mental or character type of the injured individual than I was with his physical set-up. The unstable, the pillar-to-post man, the overstimulated type, and the lazy, languid, unskilled man, industrially not adaptable, certainly accounted for many of the injuries. The man with gossip on his mind, and tailor shop discipline in his make-up, who

* Presented at the Twenty-first Annual Meeting of the American Association of Industrial Physicans and Surgeons, Atlantic City, N. J., October 7, 1936.

with folded arms, leans over to rest on a driving shaper machine is not a mechanical guard problem —he represents something of every problem the foreman has to deal with, from selection and training on through discipline. As time wore on, the perfection of safety devices and their wholesale installation, together with rigid application of safe practices by supervision, began to have effect. The last to be benefitted by all this effort on the part of the management and the ones to take the least interest in the use and applications of these new tools for their protection were just exactly the types of individuals that I have mentioned. They may also be the ones who are most difficult to impress not only with safety rules but also with good shop practice, and with company policy, and with the need for quality production, and they may be those who have the most difficulty in producing reasonable quantity. In other words, it seems to me that we may generally look for our accidents today to those men who have the fewest natural qualifications of able workmen, and to the uninstructed.

WHAT are the methods which have been employed in the safety movement in the past? From the first, the movement was largely concerned with machinery accidents, classifiable and capable of being graded mechanically. It was easy and logical to supply guards for belts, gears, and finally to extend the mechanical phase into layout and construction design. However, a certain personal factor has always been recognized in accidents, and quite early the observation was made that only one-third of industrial accidents are attributable to machinery and more than one-third of *these* accidents are due to the absence of guards. It may therefore be said that more than 90% of our accidents are due to failure of the individual.

Now, these negative characteristics which I have been talking about do not come out readily on physical examination, if at all; and long ago I came to the conclusion that an intimate knowledge of the individual, necessarily on the part of the foreman, was required and desirable for the promotion of any really effective safety program. I am talking for a moment from the angle of the industrial relations and safety promotion man, rather than from that of the medical department. *Foremen today are learning the individual.* Their managements are expecting them to know their men, their names, and their characteristics, and to have an interest in their families, and their personal difficulties. They have concluded that where men vary noticeably in height, weight, and color, they differ many times more pronouncedly and importantly, in depth, quickness of perception, temper and caution. In our present conception of employee relations we feel that this knowledge of the employee on the part of his superior represents the best form of good employer-employee relationship. It is the *common denominator of all plans* for the furtherance of those good relations. By recognizing this fact in employee relations, we have prepared the ground for the finest and most effective type of accident prevention activity. Having for some years bombarded him with mass propaganda, placards, speeches, safety meetings, and prizes for group accomplishments, we are coming to the realization of the fact that when we approach him as an individual we will really be getting some place. In so dealing with him there is only one representative of the company whom we can take into account in most cases. That is the foreman. With his authority extending only over a small group, he is in a position to know and to study his men. Factors which are important in accidents, such as the excitable individual, the mentally lazy, and the careless, as well as the uninstructed, will be best known to the foreman.

Safety habits, along with the other characteristics which go to make the man, are ratable. Advancement, increases, transfers—should carry the safety record.

No remarks about safety, as actually applied to the employee, can be of much importance unless they embrace training. Given all the natural desirable characteristics, without training or job skill, his likelihood of injury is multiplied. With skill, he knows, of course, how to work safely. Training needs to be specific to the work to be done, and to the man, in other words, to be individual. The hazards inherent in the job or its location should be gone into, and after that the necessary job explanation, demonstration, practice and repetition of correct practice to the point where skill, which means safety, is attained. The safest way should become the fixed way.

In order to give the foreman a point of departure in his study of his men, we should take care to acquaint him with the physical disabilities and departures from the normal which come to the attention of the medical department. As a matter of fact, the first and most obvious measure that we have of a new employee is his physical build and his bodily characteristics. Being the easiest information obtainable, it should be the means to further study of the individual, a wedge in the door, so to speak, by which the foreman may extend his knowledge of his men, and so attain a rounded and complete picture of the human element in his departmental safety problem. I am inclined to think that our medical departments are somewhat prone to proceed on the assumption that their information can be used best only in their own contacts with the men and with the personnel department. There should be a closeness of contact between medical department and supervision, which allows of easy flow of information both ways. The analysis of the employee by the medical department should often be the basis for careful and considered placement effort by the foreman in the confines of his department. Today, in the vast majority of cases, placement, intelligent analysis and selection, based on physical and mental traits and with consideration for economic and production problems, is the answer to the question of "what can be done to minimize accidents due to physical defects?"

NOW psychological study has shown that accidents do not distribute themselves by chance, but that they happen frequently to some men, and infrequently to others as a logical result of combinations of facts and circumstances. Newbold has concluded as follows:

"1. The distribution of accidents among workers is far from chance. The average number of accidents in any group is influenced by a comparatively small number of workers.

"2. Also the idea that the occurrence of one accident in itself makes the occurrence of others more or less likely does not fit in with observation. It appears that differences in individual *initial*

susceptibility are more in line with the observed facts."

From this conclusion we may infer that the presence of individual susceptibility or accident proneness is still the factor of importance when we are placing men at work who have physical disabilities due to trauma. In other words, the type of individual remains more important than the physical defect of that individual. This fact has a direct relation to the problem of accidents due to physical defects.

3. And Viteles says:

"Some individuals become more frequently involved in accidents than others because of either an inherent psycho-physiological predisposition toward accidents, or because of a temporary change in attitude or outlook which increases the probabilities of accident when a situation which may lead to one arises."

This is accident proneness. Statistics and observations in our plant hospitals bear ample proof of the existence of this trait, and accident proneness is not to be confused with carelessness. It has been suggested, reasonably I believe, that there is a definite relationship between the rates of minor illnesses and accidents. In other words, the tendency to accidents may be associated in a measure with a general lower health standard. My own general observations that the continued existence of minor small ailments acts as a drag on general health and so on the general level of mental activity, lead me to beleive that the conclusion is logical.

Men are grouped, or should be, in productive industry, by natural capabilities. The slow man, slow possibly because of approaching physical incapacity, who is paced with faster men, in his endeavor to keep up, may overlook safe practices. Grouped with other men with similar capabilities, he may perform profitably and safely to the company and to himself. By such care in grouping men, anxiety as a cause of accidents may be eliminated.

Today the occurrence of a severe accident is accepted not alone as a heavy expense item, but also as a gross miscarriage of our efforts for good employee relations. Sometime ago I stated, in addressing a group, that safety is a single most frequent subject of discussion in employer-employee conferences in a day when labor is conscious of its right to talk singly or collectively with management. While they talk of hours, rates, and working arrangements, there also occur constant references to safe practices, fire hazards, proper guards, and working conditions. Safety as a subject is taken not less seriously than any other by employees or their representatives.

For the medical department, a partial answer to the safety problem of the foreman is this: the medical department looks your employees over often enough to know them, thoroughly enough to know them, and having done this, *imparts* the information, does not simply *file* it. The foreman is entitled to it since he is the only man in a position to do much about it. He can use it to advantage since it rounds out his picture of the men who are working for him; and I cannot visualize a single foreman in our organization who would not use this information constructively.

Our safety men have had excellent success in the mechanical field—*good* success in *their* efforts with supervision and *fair* success *with* men in the mass. In dealing with the human and personal side of accident occurrence they have been limited usually to mass appeals to employees and to setting forth in that way the *general* advantages of safety and its effect on health and economy. There has been too much emphasis on carelessness when it came to talking about the human element in accidents. Possibly the freedom with which the term has been used has militated against analytical study of the individual; if they are all simply "careless," why not simply warn or penalize them and let it go at that?

The statement has been made by Viteles that "in the safety movement industry has already reached the point of diminishing returns from further efforts with broadside remedies and shotgun prescriptions. In a single decade it has reduced the severity and frequency of accidents in a marvelous fashion. . . . The chief concern of industry now is to hold the gains made. The fighting, the anxiety, and the excitement of pioneering, have gone out of the job; the safety movement has entered the phase of gleaning."

Industry's conception of the importance of the individual in the field of employer-employee relations, with its supervision largely well informed and receptive to any movement for the improvement of those relations, is placing in the hands of the safety man the means to do this gleaning. He need no longer spread himself too thinly over an organization. More than ever he will find alert and willing help in every foreman. The individual himself is more important than his physical defects in the production of accidents. Concentration of effort on the individual in the interests of safety supervision, medical and safety departments, should be the modern keynote to the movement; it offers the field of maximum opportunity and return to the worker in safety.

Fractures of the Forearm

—A Review of Three Hundred and Seventy-Seven Cases—

By J. E. M. Thomson, M.D., F.A.C.S.,
Lincoln, Nebraska

THIS study comprises a review of 362 consecutive cases that I have treated for fractures of the forearm. Incomplete records and insufficient follow-up data caused me to drop from this study 85 of these patients. Seven of the remaining 277 had both arms fractured, bringing the total of fractured arms to 284. Both bones were broken in 93 of these arms, giving, therefore, a grand total of 377 fractures of the forearm. A matter of unusual interest was the fact that 110 of these patients, or practically 40%, had one or more unsuccessful attempts at reduction from a fews days to several months prior to being referred to me. In other words, 40% of these cases were referred because they were unusual, difficult, or presented more than the ordinary problem of reduction; 86% of all of the operative procedures in the entire series, that is, fractures that required open reduction or direct leverage, came within this 40%.

PROCEDURE UNIFORMLY FOLLOWED: Early simple reduction was attempted by the approved manipulative methods with the application of

traction and counter-traction in every instance, with the exception of compound fractures, and was usually successful. Kirschner wire, tongs, and pins—as an adjunct to the fixation splints and the maintenance of fixed traction—were seldom essential, except in a few instances in which there was severe comminution and no opportunity for impingement of fragments. There was, however, a sizeable group of these fractures that proved irreducible in spite of adequate simple manipulative methods, and in which some type of open operative procedure was indicated. This group divided itself according to operative procedures used. In the one, the method of direct leverage for reduction of the fractures gave excellent results. In the other, a smaller group, radical operative procedures were essential to gain a reduction.

The method of direct leverage comprises the simplest type of operative procedure with the minimum amount of risk. It is relatively no more dangerous than the introduction of a local anesthetic. It is often performed with a local anesthetic. A very simple set-up is all that is necessary. Usually a tray, a gown, a pair of gloves, a scalpel, a few dressings, and a lever are all that is essential. Any type of fluoroscope may be used. In my clinic we use the head type of fluoroscope with a shock-proof x-ray tube, while at the hospital we use the fluoroscopic table. The fact that the arm can be turned from the antero-posterior to the lateral position so easily before a fluoroscope has added a great deal to the adaptabilty of this technique for forearm fractures. After the eyes have accustomed themselves to the darkness the arm is held in traction by the assistants before the fluoroscope. The conventional rules of aseptic operative technique are followed by the operator and his assistants throughout the procedure. The lever is usually introduced on the dorsal side of the forearm, over the site of fracture, through a small stab skin wound. Under the guidance of the fluoroscope the lever is directed between the fragments so that the end of the lever becomes impinged in the one fragment and the shaft rests solidly against the other fragment. The over-riding of the fragments makes it essential to introduce the lever between them at a considerable angle. After the impingement of the lever has been made it is carried through an arc towards the opposite direction; the shaft bringing pressure in one direction on one fragment, and the end of the lever bringing pressure in the opposite direction on the other fragment. Thereby the over-riding of the fragments is completely overcome, and one fragment is lifted while the other is depressed as the lever continues its course through the arc. When apposition and alignment are obtained the lever is removed and the fragments impinge. Fixation splints are then applied. This simple procedure has saved many fractures from extensive mutilating operative ventures. In this entire group there has not been a single infection or untoward complication. The period of disabilty is no longer than that of fractures treated by simple manipulative methods.

Those fractures in which this method is particularly indicated are as follows:

1. When one bone is fractured and is diffcult to reduce, either radius or ulna.

2. When both bones are fractured and one is a greenstick and the other is over-riding. Direct leverage of the over-riding fragment usually reduces the fracture without danger of completing the greenstick.

3. Fractures of both bones, in which one fracture is reduced and the other is over-riding. Direct leverage of the over-riding fracture can usually be applied without loss of position of the reduced fracture.

4. When after attempted reduction and fixation in a plaster splint it is found that although there is full length the alignment and apposition are poor. Through a fenestrated window, over the site of the fracture, direct leverage will usually reduce the fragments and bring about the desired anatomical apposition.

Direct leverage is indicated in almost any fracture in which operative intervention is indicated. It is never attempted until simple manipulative methods have failed.

After reduction, as the lever is being removed, if there is a tendency to loss of position it is appropriate to leave the lever embedded between the fragments and firmly fixed in the plaster of Paris splints for 10 days or two weeks. At that time it can be removed with little danger of loss of position.

The second smaller group of fractures of the forearm, which were irreducible by closed methods even with the help of Kirschner wire and pins, comprised a small number of oblique, comminuted, or compound fractures. These were usually of both bones, frequently having interposed soft tissues between their fragments and requiring radical open operative procedures. When an incision was made for such an operation particular care was given to the site and to its anatomical adaptability for exposure of the fragments by following intramuscular fascial planes and avoiding circulation and nerve supply, thereby minimizing the amount of soft tissue injury.

The operative procedures on the bones of the forearm were as follows, in the order of preference:

1. Impingement of the fragments.

2. Impingement and suturing with absorbable material through drill holes above and below the fracture.

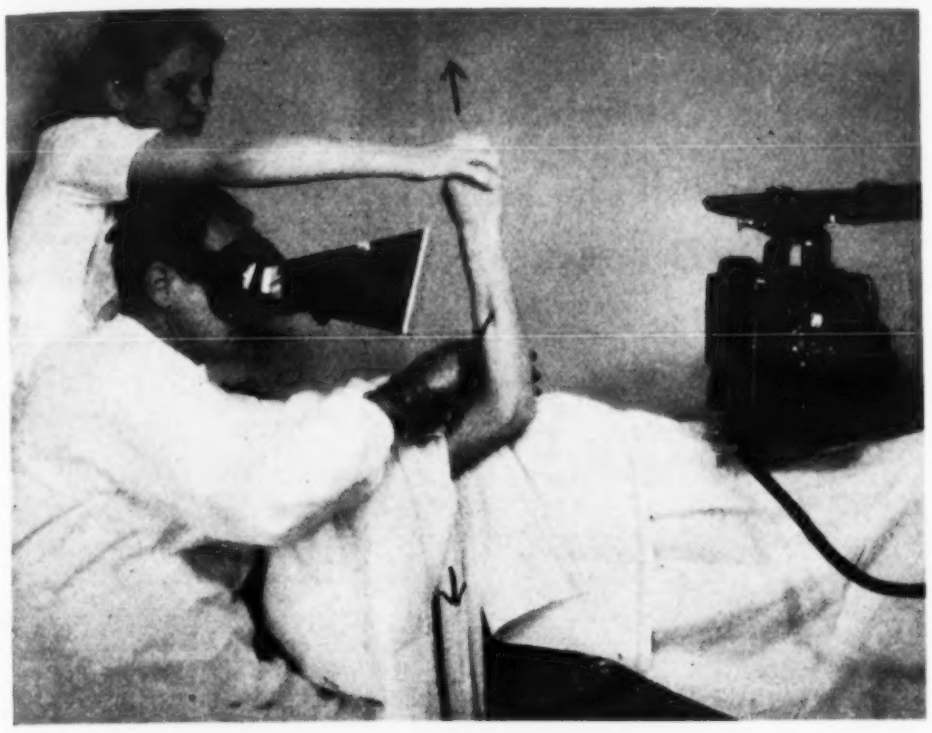
3. Notching and stepping of the fragments with or without absorbable suture.

4. Autogenous bone graft (inlay or onlay) fixed in this position with absorbable material (bone or suture).

No plates, wires, or non-absorbable materials are permanently embedded in the region of fracture.

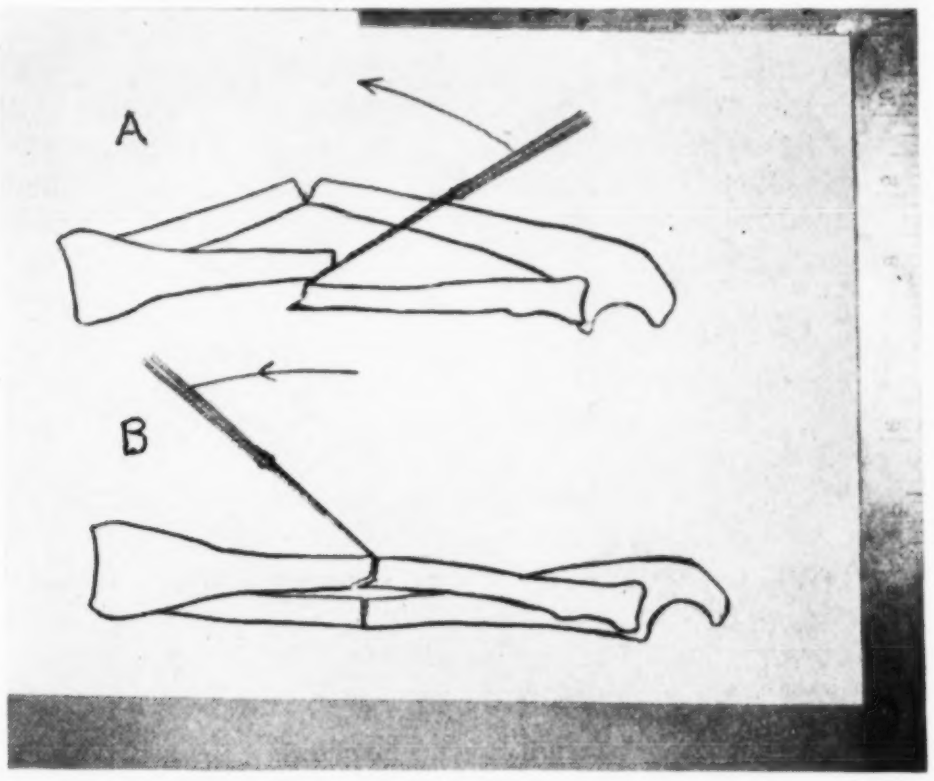
FIXATION: An adequate form of immobilization was absolutely essential to maintain position and achieve early union. Molded plaster of Paris splints were used almost entirely. Colle's fractures were put up in supination and dorsiflexion or ventroflexion. When there was a tendency for the distal fragments to slip backwards they were put up in ventroflextion in a dorsal splint. After one week, to prevent contraction of the flexor tendons, this splint was removed and the patient, of his own will, was usually able to bring his hand back to a dorsiflexed position and a cock-up splint was applied. More stable reductions were put up in dorsiflexion in a ventral splint, which extended only to the base of the

fingers. Full use of the fingers was encouraged. Fractures of the shaft of the forearm were placed in anterior-posterior moulded plaster splints, extending from the base of the fingers to the upper arm, with the arm in supination or mid-supination and the hand in dorsiflexion, the forearm at an angle of 90 degrees with the arm. Padding has been seldom used in recent years except at the upper and lower extremities of the splints and about the wrist and elbow. Constant observation and scrutiny of these plaster cast splints is essential to meet the possibility of swelling and circulatory complications during the first few days. Hospitalization, with the arm swung up under a frame for a few days, is perhaps the safest rule to follow. A right-angle aeroplane splint is desirable when ambulatory. Persistent pain or swelling is an indication for cutting and spreading of the splints. If the patient is not under absolute control every splint should be spread.

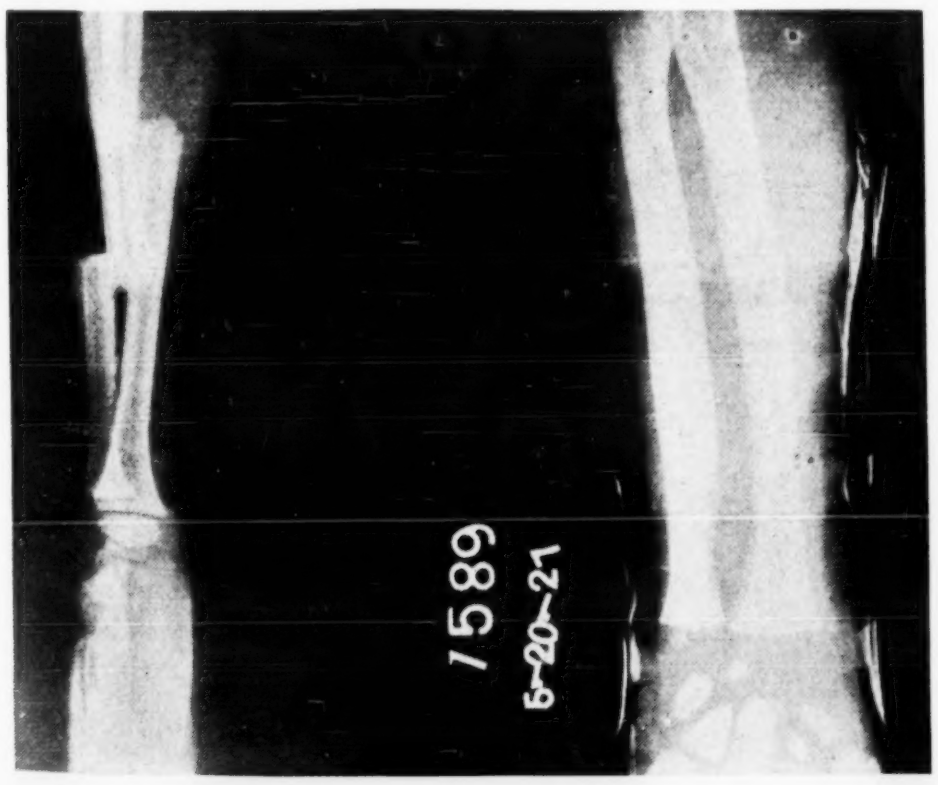


Direct leverage for reduction of fracture of forearm. Shock-proof x-ray tube and head fluoroscope are used. Traction applied by assistant holding hand; counter-traction applied through bandage about upper arm and the weight of the operator's foot in the lower sling. The lever is shown as it is directed between the over-riding fragments.

PERIOD OF IMMOBILIZATION: For Colle's fractures, in patients under 35 years of age, three or four weeks; over 35, six or eight weeks. Fractures of the shaft of one bone are immobilized a much shorter period than fractures involving the shafts of both the radius and the ulna; the periods depending entirely upon the stabilty of the arm and the x-ray evidence of union. Fractures of one bone—five to eight weeks, and fractures of both bones—eight to 10 weeks, sometimes longer. Physiotherapy is often advisable; particularly when there has been extensive soft tissue injury, or following radical surgical procedures.



A and B illustrating the arc through which the lever passed in making reduction of a fracture of the radius by direct leverage.



A. Antero-posterior and lateral x-rays of radius and ulna in which both bones are fractured and over-riding at different levels. The ulna was reduced but the radius remained over-riding and displaced.

B. Antero-posterior and lateral x-rays of reduction after direct leverage through a window in the cast.

RESULTS: There were 152 Colle's fractures. Five of these had operative procedures because malposition of the fragments had existed too long for correction by manipulation or wrench. In two of these cases I did osteotomies of the radius with reapposition of the fragments. Three were reduced by direct leverage. In two instances

the lever was embedded in the plaster splint for six days to prevent loss of position of the fragments. A Thomas wrench was used twice, prior to the leverage, to assist in breaking up the impaction. The disability period for those having osteotomy was 12 weeks, and those having direct leverage nine weeks. The average period of disability for the entire series was seven and one-half weeks.

There were 28 fractures of the radius, eight of the lower-third, four of the middle-third, none of the upper-third, and 16 of the head of the radius. In one of these fractures of the middle-third of the radius there was over-riding of the fragments and deformity of the hand three weeks later. Open operative reduction resulted in solid union in 12 weeks. The disability was four months. Direct leverage was used to reduce one fracture of the lower-third and two of the middle-third of the radius. The average period of disability of these fractures was seven and one-half weeks. The remaining eight fractures of the shaft of the radius were treated by simple manipulation. The average period of disability was seven and one-half weeks. Aside from the fact that seven of the 16 fractures of the heads of the radius were removed by open surgical operation further comment is not within the range of this paper.

There were 11 fractures of the ulna, two of the lower-third, four of the middle-third, two of the upper-third, and three fractures of the olecranon. One irreducible, over-riding fracture of the middle-third of the ulna was reduced by open operation with a resulting disability of nine weeks. Two fractures of the upper-third of the ulna were reduced under the fluoroscope by direct leverage, and they had a disabilty of five weeks. The average period of disability for the total group was five weeks and four days. Fractures of the olecranon present an unrelated problem and they are not considered.

There was 93 fractures of the forearm in which both bones were fractured; 42 occurred in the lower-third, 50 in the middle-third, and one in the upper-third. Five of the fractures of the lower-third, and 13 of the fractures of the middle-third had open operative procedures. One fracture of the middle-third had three operations on the radius with non-union and absorption of the lower radial fragment, leaving a defect of two and one-half inches. My contribution to this complication was a large tibial graft planted intramedullarily into the lower end of the radius and inlaid into the upper fragment. Good union resulted. Four and one-half months later the graft was fractured, but ultimately united. Another inlay bone graft of the middle-third of the radius four or five months after fracture did not unite solidly for 14 months after the operation, although firm union of the ulna, on which a step operation was performed, has occurred. Another similar bone graft had solid union after three months. Three osteotomies were performed to gain length for over-riding fragments and good union occurred in three and one-fourth months. Two open operations, in which the fragments were impinged, had firm union in two and one-half months. In two instances chromic catgut was used to maintain the fragments in good position, and in three and one-half months the splints brought firm union. Two compound fractures whose malposition would have led to serious disabilities were operated and the fragments helds in alignment and apposition without the use of foreign material. After six and one-half months the fractures were firmly healed. Open operation was resorted to in five fractures of both bones of the forearm in cases that have come under my care immediately after injury. Three of these were oblique fractures of the radius that did not remain in apposition after reduction by direct leverage. Through a fenestrated cast over the site of fracture, and under rigid aseptic technique, apposition was accomplished and the fragments held together with chromic catgut. In still another case, through separate incisions, both bones were reduced through a fenestrated cast. The bones were impinged and sutured, but I warn that great care should be taken when such techni-

Review of 262 Patients with forearm fractures.
84 Discarded. Follow-up incomplete.
278 Completely studied.
7 Fractured both arms.

285 Fractured forearms.
377 Fractures of radius and ulna.

Table 1

Sex	Extremity
156 Male	97 Left arm.
122 Female	187 Right arm.

Age

Occurs at any age.
26 years average age.
14% under twelve years.

Table 2

DEATHS 2

Complications

Fractured scapula	1	Dislocated elbow	3
Fractured clavicle	2	Fractured femur	2
Fractured humerus	15	Fractured ribs	2
Fractured vertebrae	2	Fractured skull	1

Table 3

COLLES FRACTURES 152

Open operations	2	Average disability	12 weeks
Direct leverage	3	Average disability	9 weeks
		Total average disability	7½ weeks

Table 4

FRACTURES OF THE RADIUS 28

	Lower	Middle	Upper	Head	Avg. Disability
Total	8	4	....	16	7½ weeks
Operation	....	1	....	7*	10 weeks
Lever	1	2	....	....	7½ weeks

* Removed.

Table 5

FRACTURES OF THE ULNA 11

	Lower	Middle	Upper	Olecranon	Avg. Disability
Total	2	4	2	3	6 weeks
Operation	..	1	..	2	Middle 9 weeks Olecranon 6 weeks
Lever	....	..	2	..	5 Weeks

Table 6

FRACTURES OF BOTH BONES—93

	Lower	Middle	Upper	Average Disability
Total	42	50	1	12 weeks
Operation	5	13		(Below)
Lever	20	19		10 weeks
	Disability from operative treatment.	(grafts? (Compound 6½ months. (Others 4½ months.		

Table 7

que is resorted to. Although I have never had an infection, following such a procedure, each break in technique lends itself to the possiblity of failure. However, the tremendous advantage in having the extremity appropriately splinted makes it possible to simplify the extent of operation, and prevents the slipping and loss of position of the fragments once they are apposed. Often after attempted closed reduction the position of one of the bones may be lost, during or after applying the splints; but through a fenestrated cast and direct leverage under the fluoroscope the apposition may be easily re-established. The period before union was complete and strong in the old cases that were operated, was three and one-half months, with the new cases three months.

The period of disability for both groups was four and one-half months.

In 20 fractures of the lower-third of the forearm, of both the radius and ulna, one or both fractures were reduced by direct leverage. In 19 fractures of the middle-third one or both bones were reduced by direct leverage. The lever was embedded into the cast in five of these cases and removed within the first 10 days. The average time of disability for those treated by direct leverage was the same as those treated by simple manipulation, 10 weeks. Four fractures of the middle-third, treated by manipulation alone, did not develop union for 16 weeks, which carried the average rather high. None of the cases in which direct leverage was used alone had prolonged disability.

CONCLUSIONS: 1. Early intelligent adequate attempts at reduction of fractures of the forearm are successful in most instances.

2. There is a very distinct group of fractures that prove difficult to reduce by ordinary methods that can be reduced by direct leverage, as follows:

(a) When one bone, either the radius or the ulna, is fractured, displaced and over-riding.

(b) When both bones are fractured and one is a greenstick and the other is over-riding.

(c) When both bones are fractured and one is reduced and the other is over-riding.

3. Direct leverage is an operative procedure of minimum risk:

(a) Not a single infection has followed this procedure.

(b) Union follows this procedure in a time equal to that of fractures treated by simple manipulation.

(c) Functional results and the period of disability, after direct leverage, are equal to or better than those treated by simple manipulative methods.

4. Extensive operative procedures usually have prolonged periods of disabilty:

(a) Delayed union is very common.

(b) However, there has not been a single case of non-union in the entire series.

(c) The period of disabilty is markedly increased over that of the closed method or direct leverage.

In comparing the results of simple manipulation, direct leverage, and various types of open operations—granting, of course, that good apposition and alignment have been accomplished—I believe that the amount of diminution of function and the length of disability is definitely increased in direct proportion to the amount of trauma and extent of surgical interference. Therefore, the simplest method of reduction that will get the result is the best.

Indirect Inguinal Hernia

By C. F. N. SCHRAM, M.D.,
Medical Director, Tennessee Eastman Corporation

NO one method of hernioplasty has proved a solution of the problem of recurrence, as evidenced by the number of volumes on the topic. The writer offers no apology for this article, but hopes by it to contribute to the solution of this problem.

The injection treatment has returned in cycles, and was, so far as the writer can learn, first written up in 1848. The transplantation of the cord, the suturing of the sac stump high up under and to the internal oblique muscle, the ligating of the sac as deeply as possible, and other procedures have all been emphasized and there is no need to enlarge upon them.

The important point stressed by all surgeons is the complete removal or obliteration of the hernial sac, and some who have had recurrences are self-critical enough to state that while they felt sure at the time of operation that they had removed all of the sac, yet the recurrence definitely told them they had not been successful in removing this sac in its entirety. The writer is confident that the consensus of opinion is that if the sac is removed in toto the hernia will not recur, and with this opinion he agrees. He has operated, ligated the sac proximal to the construction or anatomical neck (not always present) and has had a direct inguinal hernia recur on such patients.

In looking for the answer to this apparent inconsistency a study of the embryo in the descent of the testicle into the scrotum was the first step, and the writer tried to ascertain the mechanical steps in this procedure. However, he did not make the first step first. By a fortuitous circumstance at one operation after freeing the sac just as far proximal as was possible to the constriction or anatomical neck, the patient coughed and there showed a marked bulging between this neck and the symphysis pubis. The sac was opened and the palmar surface of the little finger passed into the opening along the under surface of the parietal peritoneum towards the symphsis and then the finger was flexed. The patient had a marked potential direct inguinal hernia at that time as evidenced by the loose fold of peritoneum pushed forward by the flexed finger, and leaving it untreated or treating only the indirect hernia certainly would have been poor surgery and would have been courting a recurrence.

The question arose as to why this patient should have a developing direct inguinal hernia if inguinal herniae are the result of preformed evaginations or sacs left as a result of the descent of the testicle.

It was in an attempt to answer this question that the writer started this study back at the genito-crural ridge, the separation of the lower pole to become the testicle and the descent of that testicle into the scrotum. There is small need here to review that descent.

In looking for a mechanical explanation of the loose fold located at the site of a direct inguinal

hernia and at the same time have the mechanics fit the embryological story, he took a surgeon's operating glove and with the thumb uppermost pulled parallel to the fingers on the tip of that thumb. The dorsal aspect of that thumb became tense and so did the ventral surface but to a very much less degree, and there was a loose fold at the point where the glove normally covers the web between the thumb and index. This fold corresponds to the looseness, fold or pouch of peritoneum found at the site of direct inguinal herniae. The writer does not know whether or not the testicle arrives at its destination in the scrotum by being pulled, but it is established that a neck of peritoneum accompanies it, and he believes that in this descent with the peritoneal sac the outer surface of the sac is under more tension than the inner surface and that therefore the fold that is located between the indirect hernial sac and the symphysis pubis but adjacent to the sac is possibly explained in this way. He knows that this fold is constantly present, and offers the following charts in explanation, together with his suggestions as to the eradication of this secondary pouch at the time of operation:

American Association

THE Twenty-first Annual Meeting of the American Association of Industrial Physicians and Surgeons was held in Atlantic City, N. J., October 7, 8 and 9, 1936. In attendance it was the largest meeting for the past 10 years; in excellence of its program it maintained the traditions of the Association, whose programs have always been of unusually high quality.

Elections resulted as follows:

Officers

President, DR. ROBERT P. KNAPP, Cheney Brothers, South Manchester, Conn.

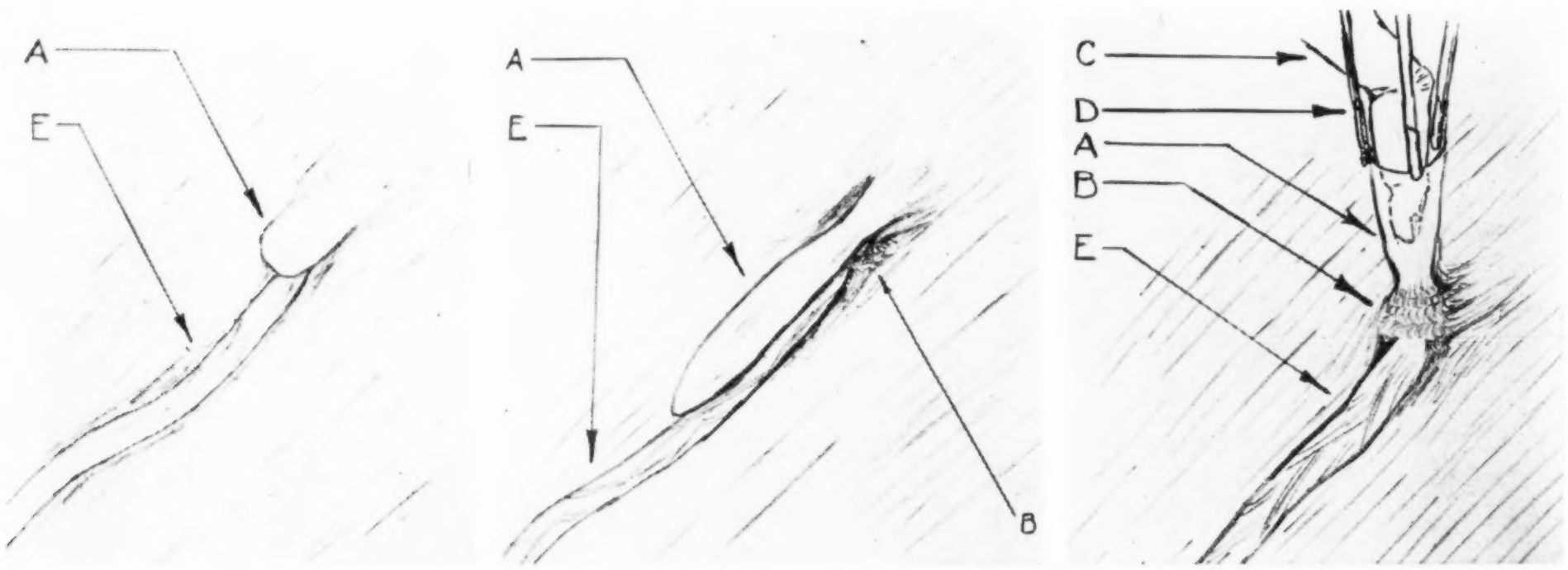
President-Elect, DR. ROYD R. SAYERS, U. S. Public Health Service, Washington, D. C.

1st Vice-President, DR. CLARENCE D. SELBY, General Motors, Detroit, Mich.

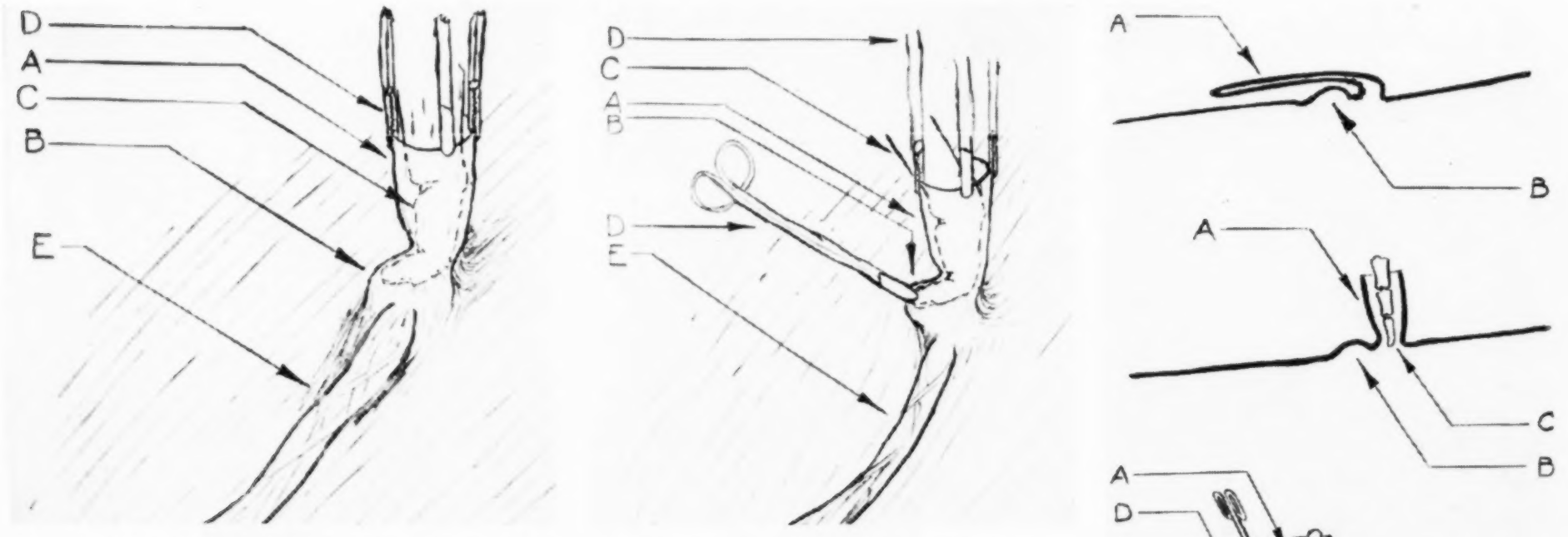
2nd Vice-President, DR. MCIVER WOODY, Standard Oil Co., New York City.

Secretary-Treasurer, DR. VOLNEY S. CHENEY, Armour & Company, Chicago, Ill.

The Directors elected, and their respective terms, are listed on p. 646.



(Left): A—Indirect inguinal hernial sac. (Center): A—Developing indirect hernial sac; B—Pouch, developing direct hernia sac; E—Spermatic cord. (Right): A—Hernial sac elevated, opened and with inserting finger; B—Pouch formed by the fold of peritoneum in the descent of testicle into scrotum; C—Inserting finger; D—Hemostat holding wall of sac; E—Spermatic cord.



(Left and Center): A—Hernial sac; B—Pouch partially elevated by flexion of inserting finger; C—Finger; D—Hemostat; E—Spermatic cord. (Right): Schematic drawing of cross section of sac and direct inguinal pouch from just mesial to the anterior superior spine to the symphysis pubis. A—Hernial sac; B—Pouch formed by fold of peritoneum in descent of testicle into scrotum; C—Inserting finger; D—Hemostat. Surgical note: The indirect sac is opened so as to include the indirect pouch and both are ligated as one.

Reducible Inguinal Hernia

—*The Injection Form of Treatment*—

by

JOHN GARFIELD FROST, M.D., F.A.C.S.,
Chief Surgeon, Chicago & Eastern Illinois Ry., Chicago & Western Indiana R. R., and Belt Ry. Co. of Chicago; Company Surgeon, New York Central R. R.; Professor of Surgery, Loyola University School of Medicine, Chicago; Attending Surgeon, Cook County Hospital, Chicago; Senior Surgeon, St. Bernard's Hospital, Chicago

A SYMPOSIUM on hernia is a very extensive subject and it would be difficult to attempt to cover it in any single presentation.* Therefore, I am going to stress one phase, and that is the injection form of treatment for the cure of reducible inguinal hernia.

In this it is not my intention to convey the impression that I, at this time, have anything new to offer toward obtaining better results, or any new form of injection treatment. The facts here presented will be my interpretations, from personal experiences, observations, and clinical studies.

It is generally accepted, I believe, that the injection form of treatment for reducible hernia is in no way of recent origin; according to available records, Dr. M. Valpeau, of Paris, France, used a solution of iodine in this method of treatment over 100 years ago. This being so, it is quite evident that none of the surgeons now practicing this treatment will attempt to take the credit of being among the first to use the injection method.

We have all seen the effects of paraffin and the results of other types of preparations which were used years ago in the injection treatment, and their end results which proved to be quite discouraging. During the last 10 or 15 years numerous surgeons throughout the world have again started the use of this injection method using various types of new solutions, some of which have shown sufficient results to merit further trial and consideration.

It should be distinctly understood that the injection form of treatment for reducible inguinal hernia is in no way intended entirely to supplant surgery; it will always be necessary in numerous types of hernia that surgical procedures of the cutting type must be used in order to obtain results. I do feel, however, that in many types of hernia the injection form of treatment will be a great supplement to surgery. We in no way consider the injection treatment a cure-all, any more than we consider open surgery a cure-all.

Estimates have been made that one out of every 22 males suffers from some type of inguinal hernia, but I feel that this percentage is much too low. In the physical examinations made at my office during the years 1933, 1934 and 1935 of the employees of the Belt Railway Company of Chicago and the Chicago & Western Indiana Railroad, our records show that 11.7% of the different types of railroad employees, have some type of inguinal hernia. These employees were of various ages.

Inguinal hernia, as found in railroad men free from this condition on entrance to service, is due to an anatomical defect in the abdominal wall not found in the inguinal region at the time of the entrance examination. The tendency in these old employees who have worked so long and diligently is that these herniae develop more often and rapidly become larger, appearing most often in the 5th, 6th and 7th decades of life.

Open surgery has very little to offer these 55 to 70 year old employees, most of whom have myocardial and kidney diseases. But the injection form of treatment has a great deal to offer them. Their ages, myocardial changes and general debilitated conditions are not contra-indications for this form of treatment. Their general conditions immediately improve under the injection treatment, their herniae are either permanently cured or so relieved that they can wear a truss and continue their regular work, their efficiency is increased, and their perspective on life is made much brighter. I believe that in such employees with hernia, and also in the recurrent post open surgical operated cases, the injection form of treatment in a great way supplants any open surgical procedure either for their cure or relief. In these types of cases it certainly is the procedure of choice.

In discussing this prevalence of hernia with DR. D. B. Moss, Chief Surgeon of the Burlington Railroad, he informed me that a careful check of some 700 employees of the Burlington—who at the time of admission were free from symptoms of hernia and who when the check was made had been in service for 10 to 15 years—showed the prevalence of hernia to the extent of 15% to 16%. It is quite difficult to portray in our minds the handicaps these employees encounter because of inguinal hernia, and the enormous economic loss to industry. We know the injection form of treatment has its limitations and must be used only in selective types, but the treatment is ambulatory, practically painless and an office surgical treatment, and from the improvement in general health and the results so far obtained, we firmly believe we are on our way to correct both the physical and the economic difficulties. Accepting these facts, it is very evident that the physical difficulties of the employees and the economic factors of prime importance to the employer demand serious study and consideration. An employee with a hernia has a reduction in his efficiency ranging from 20% to 50%. When we consider the serious complications that many times develop or follow surgery of the cutting type, in any form of inguinal hernia, and the probable two or three months' convalescence period, even with our present advance in surgery as performed by excellent trained surgeons—and it is admitted that some clinics report from 16% to 27% recurrences, and some of the Chief Surgeons I have contacted believe that in the direct type of hernia treated by open operation the recurrences are as high as 50%—it must be expected that under these circumstances other methods of cure must and will naturally be sought. With these undisputed

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* DR. FROST'S article, and the two articles which follow it, by DR. FRANK KELLY and DR. BRADLEY L. COLEY, comprise the Symposium on Hernia at the Scientific Session of the 13th Annual Meeting of the Association of Surgeons of the New York Central System, Wednesday, October 14, 1936, at Detroit, Michigan.

facts confronting us and the many undesirable complications following open surgery—infection, recurrences, atrophy of the testicle, economic losses and others—it is our opinion, based on the results we have obtained by the injection treatment, that this form of treatment does warrant a very thorough trial.

BUT we must be honest with ourselves and report our findings in an unbiased manner as we ourselves see them. If we are going to obtain success and get anywhere with this injection treatment we must be on the square with ourselves and truthfully pool our results. I know and you know that any surgeon who operates on inguinal hernia of any type has undesirable complications such as infection, bronchial disturbances, atrophy of the testicle and recurrences, sometimes terminating in death. There is also more danger in open operations when any type of anesthesia is used than there is by the injection method. I also want to say that anyone using the injection form of treatment will also have undesirable complications no matter how meticulous the care used in the injection of the solutions now being employed, at least the solutions I have tried. This is also the opinion of the men I have contacted who are using the present solutions. But these complications are not nearly so serious as those found frequently after open surgery—none has resulted in the death of the patient or left permanent undesirable after effects.

I have never seen a large varicocele unless there was some atrophy of the testicle on the same side, and I have never seen a large varicocele associated with an indirect inguinal hernia even of moderate size unless there was a pronounced atrophy of the testicle on the same side. I have also observed that an indirect inguinal hernia of long standing which protruded well down into the scrotum is many times associated with an atrophy of the testicle on this same side. It is my opinion that the contents of these old indirect inguinal herniae by continuously sliding back and forth cause trauma within the hernial sac and produce pressure on the nerves supplying the testicle, and also interfere with the blood supply, and in this manner directly cause atrophy of the testicle.

I believe it advisable before any patient is treated by the injection method for a reducible hernia that a careful examination be made to see if the testicle on the hernial side shows atrophy, and if it does show atrophy, the extent of this testicular atrophy should be shown and explained to the patient before the injection treatment is begun. It should be explained to the patient at this time that the atrophy now discovered has evidently been present for a long time. It is my opinion that the psychological effect thereby for the first time produced on the patient in discovering such a serious condition as he, naturally, now considers this atrophy to be, will be quite instrumental in obtaining desired results and eliminate future mental hazards. Before operating a large recurrent inguinal hernia it has been my practice always to explain to the patient that it may be necessary to remove the testicle on the affected side in order to obtain a cure, whether I do remove the testicle at the time of operation or not. I give the patient time to consider this procedure and obtain his consent to remove the testicle well beforehand, and I have been favorably impressed by his reactions. If I do not remove the testicle, so much the better. It has been my experience on two different occasions that surgeons have removed testicles and not previously informed the patient that it might be necessary to do so before they submitted to the open hernial operation. Both of these cases came to me so mentally depressed that they said they could hardly repress the desire to take the life of the surgeons who had then rendered them, as they considered, physically deficient. It was quite difficult to convince them that one good testicle was practically as good as two. I have always brought these serious experiences of these two cases operated elsewhere to the attention of the students whom I have had the opportunity to teach.

It can quite readily be seen that if a careful examination of the patient is not made before the injection treatment is begun, the blame for an atrophy of the testicle could readily be considered as due to the injection treatment, when in reality the atrophy had existed prior to the administration of the injection treatment but had not been previously detected.

It has not been my experience or the experience of my friends who use the injection form of treatment to have had any atrophies of the testicle or to have had an increase of atrophy from the injection treatment; and I have had no complaints of impotence developing following this treatment. But I have had patients whom I have injected for herniae who, before taking the injections, were impotent and who, after the injection treatment, were much improved in general health, reporting that their sexual function did return and that their sexual desire was very much increased.

I STRONGLY feel that one of the serious dangers confronting us in the advancement of this injection form of treatment is the fact that it will be considered a minor surgical procedure and be practiced by surgeons who have not been thoroughly schooled and trained in the technique of its administration, and the inevitably unsatisfactory results will thus have a tendency to retard the progress of what is really a very important surgical procedure. It is my opinion that anyone not thoroughly skilled and trained in this administration is no more competent to give these hernial injections than an untrained surgeon would be competent to do open surgery if given a scapel, artery forceps and scissors and permitted to do an open surgical operation for the cure of inguinal hernia without a thorough knowledge of the anatomy and a previous surgical training in hernial operative technique.

At the present time I do not advise the injections of large scrotal herniae for the reason that the results may not be as satisfactory as in the selected type. And unsatisfactory results, of course, will forestall and hinder the advancement that has been made in the injection form of treatment in the last 10 years. But I will admit that on many occasions large scrotal herniae can be greatly benefitted, with the patients made to feel much better and to become symptom free.

The mechanism of cure is by the formation of new connective tissue at the hernial site without the destruction of normal tissue. But at the same time this newly formed tissue must be strong and permanent, and must maintain a lasting suitable

support. The various experiments made on lower animals, and the observations on human beings treated for hernia with the injection treatment who were later treated by open operation because of their desire not to continue the injection treatment to its conclusion, show that a very pronounced exudate is first formed in the area injected, and that this exudate is later transformed into firm proliferative fibroblasts. It is only natural, therefore, to expect that this connective tissue which is caused to be placed by the injection treatment over and near the internal inguinal ring must of necessity close the internal ring sufficiently to produce a cure of the hernia injected, the connective tissue constricting and obliterating the lumen of the hernial sac, besides forming a substantial local support.

We all know that this injection method is a very scientific surgical procedure. It is much more than a mere hypodermic injection; it is a sound surgical form of treatment based on scientific study and principles that can only be accomplished properly by having a thorough training in the technique and an accurate knowledge of the parts to be injected. And so I cannot stress too strongly that no one should attempt to give the injection form of treatment until after he has had a thorough training in the technique of the administration of these sclerosing solutions and has also made a careful study of the anatomy of the parts to be injected before it is attempted on human beings. The mode of technique of this injection treatment will naturally be developed by the individual giving the treatment, but meticulous care must be taken to avoid the sac, cord, inguinal nerves, blood vessels, and infection. It is absolutely imperative that the injection solution must be injected under the fascia of the external oblique muscle into the inguinal canal if satisfactory results in the cure of indirect inguinal herniae are to be obtained.

THE ideal solution for injection has not as yet been found, but when it is found it must be non-toxic, must cause practically no pain and no undesirable systemic reaction, should produce no undesirable after effects if given intravenously, must cause no serious peritonitis if given intraperitoneally, and must not obliterate the local blood vessels or cause a perforation in case it is injected into the intestinal wall or bladder. Yet at the same time it must stimulate local tissue sufficiently so as to form an exudate that will be followed by the formation of new elastic tissue, composed of firm proliferating fibroblasts which will remain firm and permanent over the area of the abdominal wall that demands this support. There must be no destruction of live tissue to accomplish this. Since this quality of solution has not as yet been found, we must expect complications such as systemic reactions and recurrences. But even so we must continue, as mentioned before, with the solutions we now have and do many more scientific experiments on lower animals until we are able to find a solution that meets all these specifications.

It should be understood that the wearing of a suitable truss with the complete cooperation of the patient is at least 60% of the effectiveness in establishing a cure. This makes it practically impossible to treat cases in charitable institutions without expecting many recurrences. I personally feel that if a cure is not obtained in the selected types of inguinal hernia treated, the direct causes of the failure will be the lack of cooperation of the patient, and the improper care and attention given the patient by the surgeon, along with faulty technique in the administration of the sclerosing solution.

I have had the privilege of making over 100 injections of the internal inguinal and external inguinal rings of bodies, who have recently died, with colored solutions to make a careful study of where the solution travels, these bodies having been dead from six to 12 hours. I have used aqueous, 80% alcohol solutions and also sclerosing solutions colored with methylene blue. I have injected them both slowly and rapidly and have made the following deductions:

If the needle is passed through the external oblique muscle on the medial rectus side from one-half to one centimeter from the lower edge of the external inguinal ring into the inguinal canal 3 cc. of the solution will completely fill the inguinal canal from the external to the internal ring and the solution will completely surround the spermatic cord and fill the areolar tissue of the inguinal canal. If 3 cc. of the sclerosing or aqueous solutions are injected into the internal ring on the medial rectus side the inguinal canal will be filled completely in the same manner. I have observed that the colored solutions on all occasions have completely surrounded the cord, making me believe that it is unnecessary to attempt to inject through the Poupart's ligament side or underneath the cord in order to distribute the solution to the tissue in that area. Since I have made these experimental studies I have modified my technique in the injection of the indirect inguinal type of herniae. When I use plain Proliferol I give 3 cc. into the internal inguinal ring area at the time of the first injection and 3 cc. either three or four days later into the area of the external inguinal ring, providing there is no tenderness or swelling present, in order completely to surround the cord with sclerosing solutions, believing that there will be less interference with the spreading of this sclerosing solution during the first two injections. I believe the first two injections are of the greatest importance; the patient at this time shows the most interest and cooperation. In many cases the hernial sac will not protrude after these two injections. From then on I continue injecting the internal ring no oftener than once a week, and then under no circumstance if pain is present. I give six or eight injections, one each week, and give the patient a month's rest. At the end of one month's time I continue further treatment along this same line. The patient wears the truss continuously during this period.

NATURALLY, the question arises as to the number of cures, or the percentage of cures, obtained by the injection form of treatment. I have had only 18 months of experience. In the last two years I have operated at the Cook County Hospital, Chicago, and on private cases, at least 200 inguinal herniae. I have had the privilege of seeing and examining only a few of these herniae since that time and, therefore, it would be absurd for me to state that I have had 100% cures in the open operation on those 200 cases over that period of time. My experience with the injection method has been quite limited—as stated, 18 months—and

I have no statistics to offer regarding the number of cures I have obtained with this form of treatment. I feel that in both the open surgical procedure and the injection surgical procedure for the treatment of herniae of any type the word "cure" should be eliminated.

When I read the many articles published at the present time regarding the cures obtained by the injection form of treatment, ranging from 92% to 98%, I cannot help but feel that sufficient time has not elapsed or that a careful re-check of the cases treated has not been done. I have been asked so many times by skeptics who have examined cases I have treated: "How will this case be 10 or 15 years from now?" Naturally, no one can make positive statements as to such circumstances. But I can make two positive statements:

1. That all of the cases I have treated have shown an improvement in their general health, and after the 4th or 5th injection they have all said that something had taken place, that they are not nearly so tired after a day's work as they were previous to taking the injections treatments; and

2. That in all the cases I have treated there has been a marked reduction in the size of the hernia.

And when I read some of the articles in various journals stating that this treatment is free from complications and is a simple procedure, practically without dangers, I become skeptical. I was treating an old gentleman 66 years of age. At the completion of the 7th injection he complained of severe pain in the area that was injected. I was positive the needle had not entered the abdominal cavity, the cord or the sac, because some 12 or 15 minutes had elapsed from the time of the injection of the local anesthesia and up until the time of the removal of the needle he was absolutely free from any objective or subjective symptoms. While he was still in a reclining position, apparently not at all nervous, he went suddenly into a collapse and became pulseless, his pupils were completely dilated, there was difficulty in breathing, and he immediately broke out in a profuse perspiration. He apparently had all the classical symptoms of acute shock. I knew the injection had not been made in the vein because I aspirated frequently during the administration of both the local anesthesia and sclerosing injections and aspirated just before I attempted to remove the needle. I immediately administered 2 cc. of Coramine by hypodermic injection, and kept him in this same reclining position. His symptoms were quite alarming, and it was necessary for him to remain at my office for a period of some three hours before he was able to go home. He walked out unassisted and was taken to his home in a machine. I continued his treatment a month later without further complication. He gave a history of being quite tired, having worked all night for several nights. This was during the month of August, 1936, and on account of the extreme heat he had been unable to sleep during the day and obtain his proper rest. I arrived at the conclusion that these old gentlemen who work at night and are tired and greatly fatigued should not be injected during the morning immediately after returning home from work. I believe in these cases where the men work nights, it is much better to have them go home and get their regular sleep, and then inject them before they go to their work in the evening. I discussed this matter with Dr. Lawrence Quillin, District Surgeon of the Illinois Central, who informed me that he has had a similar experience. And I discussed it also with Dr. Wm. McMillan, of Northwestern University, who informed me that since the publication of his last article he gave an injection to a man 50 years of age, and that after leaving his Clinic the man collapsed. He was examined by a heart specialist, who pronounced his condition as a heart block. Dr. McMillan's case was taken to a hospital, remained there a few hours, and was then sent home. Evidently he did not have a heart block, for there were no further complications. Dr. McMillan's case, after a careful re-check, showed he had been treated previously for organic heart disease. I discussed this same condition also with Dr. Arthur F. Bratrud, of Minneapolis, and he informed me that he has had similar experiences, with some of which it was impossible for him to use any sclerosing solution that contained tannic acid. Doctors Quillin, McMillan, Bratrud and myself have no logical explanation of this condition. In each individual case a different sclerosing solution was employed. Strange as it may seem, three different types of sclerosing solution that are on the market today were used at the time these complications occurred. I mention this experience, and have the privilege of quoting the Doctors above named, for the benefit of those who have felt that under no circumstances are they to expect complications during the administration of the injection treatment. We also feel that we have had enough experience in the technique of the administration of this treatment not to blame the complication to a faulty technique. None of these complications resulted in fatal termination, and the effects of the complications disappeared within three or four days with no undesirable symptoms.

I have had no gangrene sloughing or infection following any of the injections I have given.

THE technique I have employed is as follows: At my office I strip the patient to the waist and measure him for a suitable spring truss. The pubic hair is clipped before the patient is fitted with this spring truss. After the proper truss is selected I, personally, apply the truss—the patient being in a reclining position and after I am positive that the hernia has been completely reduced and the hernial sac is free from any foreign material, such as omentum or intestines. I apply the truss and advise the patient to wear it night and day, care being taken that none of the contents of the hernia come out through the hernial opening. I ask him to return in three days to see if the truss has maintained the hernia completely reduced for that period of time. I insist on his wearing the truss for a week or 10 days and sometimes for a longer period, so he becomes accustomed to the feel of the truss and gets acquainted with the feel and irritation that is usually produced over the inguinal skin area where the truss pad fits. There are many types of spring trusses on the market, but the type used should be one that will continuously maintain and hold the hernia completely reduced. I have been using a double-spring truss on all herniae, single or double, because it has been my experience that it fits better and holds the hernia properly. It is my opinion that a properly fitted truss is just as important as the hernial injections. I place the patient in a reclining position and thoroughly cleanse the area over which the injection is to be

given either with alcohol or ether, ether preferred, and select a 1½ or 2-inch No. 22 or No. 23 gauge short-beveled needle, one with a bead preferred, so that in case the needle would be broken there would not be so much danger of it getting underneath the skin. I have two colored syringes—one containing 2½ cc. of either 2% nupercaine, 2% novocaine or 1% metycaine. I see no advantage in either of these three solutions that I have tried. I take considerable time in locating the cord where it comes out through the external ring with the tip of my index finger which has been placed in the external inguinal ring by advancing along the pubic spine. After I am sure the cord is removed externally to my index finger I take my syringe with the 1½-inch needle and place it perpendicularly to the tip of my index finger that is now placed in the external ring and then pass the needle down through the skin, subcutaneous tissue until I feel the resistance of the external oblique muscle underneath the point of the needle. After meeting the resistance at the external oblique muscle I hesitate slightly and then pass the needle about one-half centimeter from the edge of the internal inguinal ring, passing the needle on through the external oblique muscle on the rectus muscle side into the inguinal canal, aspirate, and, if there is no blood in the syringe, inject two or three drops of the local anesthetic solution and wait some 10 seconds to see if the patient complains of pain. If there is no pain, I continue to aspirate and inject slowly until 2 cc. of this solution has been injected. With the needle left in this position, the point of the needle being in the inguinal canal, I wait a period of five minutes and take another syringe that contains 3 cc. of the sclerosing solution and apply the syringe to the needle that has been left in position in the inguinal canal through which the local anesthesia has been given. I first aspirate to see that the needle is not at this time in the lumen of a blood vessel and is free from blood, give two minimums of the sclerosing solution and wait at least 15 seconds to see if the patient complains of any disagreeable sensation or pain. If he does not, I continue to give this sclerosing solution, and continue to aspirate frequently until the entire sclerosing solution is given. I disconnect the syringe that contained the sclerosing solution and attach the first syringe that contained the local anesthesia, again aspirate, and if there is no blood in the needle, inject ½ cc. of the local anesthesia, thereby cleaning the needle of the sclerosing solution. The reason for this is that on many occasions, after the sclerosing solution has been injected, in pulling the needle out of the tissue some of the sclerosing solution escapes above the external oblique muscle and causes pain and discomfort for some 10 or 15 minutes. I have also found that at the completion of the injection, if one does not remove the syringe from the needle before the needle is removed from the tissue there is less chance of any escape of sclerosing solution through the needle by means of suction, which might also cause discomfort. It has been my experience that the less pain these injections cause and the more painless they are made the more confidence the patient has and the more willingly he will return to the office for further treatment. I make direct pressure immediately over the area injected and apply the truss while he is still in this reclining position. The truss pad is applied next to the skin over the internal inguinal ring and worn continuously in that position. A fresh sterile dressing is placed over the area injected immediately after the injection is finished and the needle is withdrawn. This sterile dressing is left underneath the truss pad to prevent infection and keep the truss pad more sanitary.

In case the hernial solution is injected in the subcutaneous tissue, a large indurated mass develops the size of a small hen's egg, resembling an enlarged gland—this is quite tender and remains painful, and it will quite readily be seen that the pressure of the truss over this injected area would cause continuous pain, and interfere with and delay the continuance of the treatment.

If the hernial solution is injected into the peritoneal cavity, severe immediate epigastric and general abdominal pain begins at once. The injection must be discontinued immediately for that day may be repeated seven days later. Abdominal pain is also noted when the injection is just over the peritoneum, so one can readily see the importance of the slow injection of the hernial solution. Two or 3 cc. of a novocaine solution are used for the local anesthetic, followed five minutes later with 3 cc. of the hernial solution injected through the same needle that has been permitted to remain in the original proper position below the fascia of the external oblique within the inguinal canal. If the point of the needle punctures a deep vein the needle should immediately be removed and direct pressure be made over the injected area for some three or five minutes to prevent the formation of a deep hematoma. I do not advise repeating the injection for at least five days.

THERE are many conditions not amenable to this injection form of treatment, some of which are:

Irreducible herniae of all types.
Herniae complicated with undescended testicle.
Large herniae that cannot be held continuously by a truss.
Femoral hernia with a large fat pad.
Hemophilia.
Severe exophthalmic goitre.
Large herniae in very fat individuals.
Large incisional herniae.
Sliding herniae.
Large umbilical herniae.

Organic heart disease, nephritis, diabetes, herniae in young children or in the aged—none of these conditions is a contra-indication for this injection treatment.

The method to be followed in the injection treatment for reducible inguinal herniae is:

1. Treat by the injection method selected cases of reducible hernia.
2. Spring truss continuously supporting and maintaining hernia.
3. Truss to be worn night and day during the first month of treatment.
4. Truss never to be removed unless the patient is lying flat in bed.
5. Do not attempt to elicit hernia by coughing after treatment is begun for 30 days after first treatment.
6. Sixteen injections necessary; give eight injections, wait 30 days and give eight more.
7. Truss worn six months after the last injection during the day; may be removed at night.

8. In case of apparent recurrence, give six more injections.

9. Patient may continue at regular work while being treated providing his truss maintains his hernia at all times.

10. Advise returning for a check-up at regular four-month intervals for two years—after treatment.

In the injection treatment I have used Proliferol Solution "B", Proliferol Solution "T" (Proliferol with Thuja mixture), Thuja mixture plain and Pina Mestre Solution. I have had by far the best results and fewer complications with the Proliferol Solution "B" developed and manufactured by the Ulmer Pharmacal Company of Minneapolis, Minnesota. The dosage I use of the Proliferol Solution "B" is not over 3 cc. with each injection, Proliferol Solution "T" not over 2 cc. with each injection, of the Thuja mixture not over three minimums (drops) given with a tuberculin syringe with each injection and Pina Mestre not over 5 cc. with each injection.

I realize some of us who practice this injection form of treatment will be termed charlatans and quacks before our radical critics see the light. And I will admit that I am not over-enthusiastic in the injection form of treatment for the cure of reducible inguinal herniae. But I do believe that the truth does lie somewhere between those so radically opposed and those so radically for this treatment. If I had an inguinal hernia that was suitable for the injection form of treatment, I would very much prefer the injection treatment over an open surgical procedure for the cure of my hernia.

I am very much indebted to Dr. Lawrence J. Quillin, District Surgeon of the Illinois Central, Chicago, who was the first to interest me in this injection form of treatment; to Dr. Wm. M. McMillan, of Northwestern University, whose Clinic I have attended, and especially to Dr. Arthur F. Bratrud, of the University of Minnesota, whose instruction and advice, during my several visits to his University Clinic in Minneapolis, have been most valuable to me.

Injection Treatment of Hernia

—Some Experimental Work —

By Frank A. Kelly, M.D., F.A.C.S.
Attending Surgeon, Grace Hospital and Evangelical Deaconess Hospital; Consulting Surgeon, Detroit Receiving and Highland Park General Hospital; Special Lecturer in Surgery, Wayne University College of Medicine, Detroit,
Lawrence Pratt, M.D., and Alice Palmer, S.B.

I WANT to express my very special appreciation for being invited to talk on the subject of hernia before this group because of the fact that I know you are deeply interested in the subject and because it has been the subject of very special interest to me for 25 years.

I developed a hernia myself about 25 years ago and had it operated by a very excellent surgeon. It recurred within a year and I had to have it operated again. This, of course, brings to the fore the question of recurrence in hernia, and I am quite sure that a great many men are not reporting their true recurrence rate, possibly through lack of follow-up in their cases. And I am convinced that the average recurrence rate is much higher than is ordinarily reported.

A history of the injection treatment of hernia dates back 101 years when Valpeau reported his experiences. Pancoast, in his Surgery, published in 1844—a copy of which I have in my office —reports his own experience and refers to Valpeau's work nine years previously. However, in the intervening time until the last few years very little investigation or work along this line has been done, but during the last few years a new interest in this subject has become apparent.

Many men of unquestioned ability and standing in their profession have been using this method and are very enthusiastic about its possibilities, and most of the outstanding medical journals are now carrying extensive articles on the subject.

The insurance carriers and large employers of labor are tremendously interested in it. The problem has assumed such aspects now that it cannot be laughed off, nor can we dispose of it by ridicule. Its economic aspects are very important, both to the insurance carriers and the employers. If a man can have his hernia corrected by the injection treatment, he loses no time from his work and he has no hospital bill. This, of course, should result in a very great saving.

Now, if we are to consider the possibilities of curing hernia by injection, we must change our entire concept of the hernia problem. Most of us have felt that the hernial sac was the important element and that the removal of or destruction of the sac was essential to *cure* and that the existence of the sac was essential in the *production* of a hernia. However, in all fairness, it must be admitted that there is one very distinct error in this concept which immediately becomes apparent when we see the very numerous cases of hernia which have devedoped at the age of 40 to 50 years and upon operation we find a congential sac. In other words, a man has had an indirect hernial sac since before birth but has not developed a hernia in all these years. It, therefore, seems reasonable that something must have happened at about this time so to relax the structures about the neck of the sac as to allow some of the abdominal contents to enter the already pre-formed sac. To my mind, the only possible thing that could happen would be a relaxation of the fibers of internal oblique and tranversalis in this region. It seems to me, therefore, that the only hope we can have of curing these herniae by the injection method would be to cause a tightening or constricting of these relaxed muscular fibers.

For several years I was able to observe some of the cases of the late Dr. Mayer of this city, and saw him do a number of injections. I became interested further and proceeded to treat some cases using this method. I am sorry to say that my results were very far from satisfactory.

Nearly a year ago, we decided to do some experimental work, and consequently began injections upon a number of dogs at the Wayne University College of Medicine. In our first series, we used four solutions which are prominently mentioned in the literature on this treatment. Sections were taken from the injected areas at 10-day intervals. The results at the beginning were most gratifying. The microscopic slides made 10 and 20 days following injection showed

beautiful fibroblastic proliferation, and we felt that we were going to be highly successful. However, as we continued to take these slides at 10-day intervals, we found that the fibroblastic tissue gradually melted away. By the end of 50 days it had almost disappeared, and by the time 100 days had elapsed there was no evidence whatever of this fibroblastic tissue remaining.

At this time it became apparent to us that if we made this report manufacturers of other solutions might say that our failure to get results was because we had not used *their* solutions. We, therefore, began another series of dogs with other solutions. This last experimental work we have not entirely completed but have specimens up to 40 days and our experience with these solutions is the same as with the former ones. That is, that excellent fibroblastic tissue is *formed* but is not *maintained* beyond 40 days to any considerable extent and we believe will be entirely gone before the hundred days from time of injection has passed.

During all this time, we were personally injecting a number of cases. We were able to produce definite firmness and hardness in this region. The hernia disappeared and we were very enthusiastic about our results. Several patients, who had been discharged from employment because of hernia, were sent back to their work and were re-employed because the doctor could find no evidence of the former hernia. However, as we repeatedly examined these men the area lost its firm feeling. The tissue took on a more normal feel and the hernia gradually reappeared. This condition which we found clinically has very closely approximated the condition that we were finding experimentally.

Our first preliminary report of this work was made to the Detroit Academy of Surgery, Past-Presidents' Meeting, May 14, 1936.

A point that we cannot emphasize too strongly —as Coley so aptly emphasized to me recently: "The same criteria of cure must be applied in the injection treatment as in the operative treatment." In other words, I do not believe we have any right to consider that a hernia has been cured either by injection or by operation until one year has elapsed since the operation or injection, and the truss has been discontinued.

A great deal is being said in the articles on the injection treatment of hernia on the location of the internal ring. Almost every article we read places it just about the mid-point between the anterior-superior spine of the ileum and the spine of the pubis. I would like to sound a little warning here. The internal ring is *not* a fixed point and consequently moves downward as the hernia progresses in duration and in size until finally after several years, and when the hernia has attained a large size, the internal ring is approximately very close to the external ring.

Since there has been so much said about the possibility of atrophy of the testicle and impotence following the injection treatment, I suggested recently that it might be well to make a note of some degree of atrophy of the testicle upon the first examination. Seriously, I do not believe there is any great danger of causing either impotence or atrophied testicle for the reason that if one should get the needle into the veins of the cord, he would become immediately aware of it on drawing back on the plunger of the syringe, which should always be done before any solution is injected.

The danger of injecting into the vas is extremely slight for the following reasons: This structure is very sensitive and the patient would immediately complain of pain if this accident should happen. The vas is very firm and would most surely, under ordinary circumstances, move away from the point of the needle. Furthermore, if the vas were punctured by mistake and a solution injected into it which entirely occluded it, it should have the opposite effect from causing impotence, but should result in a modified Steinach operation.

My clinical experience covers 525 injections on 25 different cases which gives us an average of 21 injections per case. As yet, we are not sure that we have cured any one. I am satisfied that we can produce fibroblastic tissue in such amount that it would cure a large number of herniae if it could be maintained. But as yet we have not been able to maintain it.

In conclusion, I do not wish to be destructive. I believe that this is a matter of tremendous importance to the hernia sufferers, to their employers, and to the medical profession. I believe that there is a chance of us finding some solution or solutions that will produce and maintain the fibroblastic tissue necessary for a cure. I do not believe that such solution or solutions have been found yet.

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The Old and the New

In Treatment of Hernia

By BRADLEY L. COLEY, M.D., F.A.C.S.,
Chief Surgeon, New York Central System

HERNIA has been one of man's afflictions since time immemorial, and its treatment has been a problem to the medical profession through all the ages. Our earliest records show that crude trusses were used to retain or restrain hernias and to mitigate the annoyances and suffering of the patient. These trusses were fundamentally quite similar to those in use today. Surgery was resorted to only for the relief of strangulation; hence the term *herniotomy*, meaning a cutting of the constricting tissue at the neck of the sac. With the advent of antiseptics, and later asepsis and anesthesia, it becomes possible to undertake operations other than the emergency measures just mentioned.

In the long list of men who have contributed to the operative cure of hernia, Bassini deserves first place, for his method has stood the test of half a century and is universally recognized as the great standardized procedure. Many modifications of his method have been introduced by surgeons all over the world, and some of these have their points of value and are distinct advances.

In the recent past, the most important contribution to the operative treatment of hernia has been

that of Gallie and LeMesurier, of Toronto, who in 1921 advocated the use of strips of living fascia lata for suture material in the repair of certain types of hernia. Koontz later found, by experimenting on dogs, that heterogenous fascia served the same purpose, and he used ox fascia, first in animals and later in humans, and reported successful results. Wangensteen has recently devised a method of utilizing the fascia lata as a pedicled flap brought up subcutaneously with nerve- and blood-supply unimpaired and sutured over the defect, be it inguinal or ventral.

Suture Material

THIS subject has long been one of great dispute. In the early 1900's there were two distinct schools of thought: one which defended the use of non-absorbable buried sutures, such as silk, and the other which favored only absorbable sutures of chromic catgut or kangaroo tendon. My father, as well as Dr. William T. Bull and most of the other New York surgeons, belonged to the latter group which strongly condemned the use of non-absorbable sutures. I recall him telling us younger surgeons of the hours spent in the clinic at the Hospital for Ruptured and Crippled fishing out silk knots with a crochet hook from hernia wounds of patients operated on elsewhere. But time has seen silk restored again to favor. Improved technic, use of smaller caliber silk, more careful asepsis, gentler handling of the tissues, greater accuracy of hemostasis—all are factors that have permitted its resumption; and we now use silk almost exclusively on our service at the Hospital for Ruptured and Crippled. As a matter of fact, disciples of Halstead, of Johns Hopkins, have carried the *silk technique* to many surgical centers throughout the country and the results obtained seem to justify the faith they have placed in it. We have found that it has definitely reduced the incidence of postoperative wound infection of all degrees of severity, and that the wounds show a distinct lessening of tissue reaction during the postoperative course. Whether this improvement is due solely to the use of silk or is a result, in part, of the meticulous care exercised in carrying out the silk technique, I am not prepared to say.

Recurrence

OUR attention must be focused on the fact that recurrence follows operation for inguinal hernia too frequently. Many factors are concerned, some within our control, others beyond it. Among the former may be mentioned the improper selection of cases for operation, e. g., those with persistent severe cough, or those whose occupation entails unduly heavy lifting. In addition, failure to select the type of operation suited to the individual case, failure to remove the entire sac or sacs—as in the saddlebag hernia or the oblique hernia with an associated small direct hernia through the linea semilunaris,—the placing of sutures under too much tension, failure to provide adequate closures of the transversalis fascia in direct hernias,—all these are matters under the surgeon's control.

Among the uncontrollable factors may be mentioned the condition of the patient's tissues. Adiposity is a notable handicap, for these fat patients usually have flabby muscles and attenuated fascia; also, the excess of properitoneal fat tends to be extruded through the gaps between the deep sutures and, acting as a wedge, permits a bit of the peritoneum to protrude, resulting in a true recurrence.

Second or third attempts to cure a recurrent hernia are fraught with difficulties that are often progressively greater. It seems that damage to nerve- and blood-supply, and the presence of scar tissue and alterations in the anatomy and physiology of the structures concerned in the repair, are matters that are made worse with each successive surgical attempt.

Injection Treatment of Hernia

IT IS no wonder, then, that recurrence and morbidity and a slight, though real, mortality rate, should prompt the profession to seek some other means of curing hernias. The injection method was practiced more than a century ago, in Velpeau's time, and the subsequent bibliography is voluminous. Almost every conceivable form of irritant solution has been tried, from oak bark to carbolic acid. Recent revival of interest in this method has been remarkable, and is a spectacular example of the cycle of medical thought that begins with a discovery and extends through the stage of enthusiasm on to the stage of cold analysis of results with its attendant disillusionment followed by gradual abandonment of the method. Then after a longer or shorter interval, there is rediscovery or modification of the old method, and the cycle is repeated.

Just two years ago I became interested in reports of success with the injection treatment of hernia carried out in a large midwestern city. I talked to the Chief Surgeon of one of the railways in this area, and he admitted that he felt encouraged by their early results. Whereupon, with the full cooperation of Dr. Carl G. Burdick, Chief of the Surgical Service, we planned to give the method a fair trial at the Hospital for Ruptured and Crippled. We felt that the profession looked to a hospital like the Ruptured and Crippled for advice and opinion on any changes in the technique and treatment of hernia, and we wished to base our opinion on actual knowledge rather than hearsay which might be biased.

We began in October, 1934, and during the succeeding two years we injected 66 patients with 92 hernias. Our early results, during and shortly after the injection period, coincided very strongly with Dr. Frank Kelly's experience with injections in dogs. The clinical picture of hernia in these individuals in many instances disappeared. The patients, and we who were doing the work, felt that decided improvement was taking place. This continued over the period in which they were wearing their truss and for a variable period thereafter. In some instances almost a year elapsed before the hernia reappeared.

From a study of our results, I believe we are forced to conclude:

1. That the indications for the injection method are strictly limited. At present we would exclude all except indirect inguinal hernias in patients who refuse operation or in whom operation is contra-indicated because of age, general condition or previous multiple operative failures.

2. These patients should be warned that they may have to wear a truss indefinitely during the active part of each day; that the slight fibrosis

resulting from the injections may permit of its removal during the inactive periods, and may retard the inevitable increase in size and troublesomeness of their hernia. (NOTE: By *slight hernia,* I mean the terminal stage, because there is undoubtedly a marked fibrosis in the early stage as Dr. Kelly has shown in his dogs; this, we believe, has existed in our clinical cases also, but has later become absorbed).

3. The results of this method, if reported, should be subjected to the same critical standards as are used for judging operative results. In the publications I have read, there has been a notable lack of agreement on the number of these so-called cures that have been followed for any considerable period of time. Until such records are forthcoming, I think we shall have to regard them in the light of unproved results.

4. To regard an injected case as cured until examination by a competent surgeon at least one year after the truss has been discarded reveals no evidence of hernia, seems to be quite unjustifiable.

5. According to the results thus far obtained, we do not believe the injection method should be substituted for surgery in operable cases.

6. Until statistics are forthcoming that point to a much higher carability of hernia by injections, we shall not resume the method.

The last slide I wish to show represents an advertisement taken from a medical pamphlet widely circulated among doctors, and sent to me by Dr. Kelly. I regard it as of considerable interest, and as showing the commercial aspect of the injection method. From this advertisement, one would get the impression that the various medical journals, such as, *Surgery, Gynecology & Obstetrics*, INDUSTRIAL MEDICINE, and so on, endorse this particular solution. However, on reading the article in each case you will find that the authors do not specifically endorse this solution, nor give any opinion which would lead one to believe that the journal was behind it; neither does the article so state. But it is this idea of commercializing the injection treatment, putting it in the hands of any surgeon who has the nerve and any patient who is willing to submit to its use, that is most distasteful to me.

Furthermore, there are rather serious objections to this method, namely, it requires treatment over a prolonged period of time. While it is a matter of economic importance not to have to lose time from work or to incur hospital expenses —practically all of the patients we injected were able to carry on their vocation fairly well during the injection period—it is also true that a method requiring injections over a year's time, and by which it cannot be said that hernia has been finally cured, can hardly be regarded as ideal.

I will admit that there are still certain cases I should not care to operate on, even though the field of operability has been largely extended in recent years by better anesthetics, more care in the pre-operative preparation of the patient, and more speed and dexterity on the part of the surgeon, so that we do not hesitate as much as formerly to operate on people of advanced years.

There is one case in this series on which I should like to comment. It is that of a railroad employee, aged 28, who stated that he had been operated upon for varicocele on the left side, some years before. He came to us with a left inguinal hernia that had substantially protruded and was painful. It was reduced by one of our company surgeons and he was sent over to the Hospital for Ruptured and Crippled. Because it was an oblique hernia in a young individual, we decided to treat him with injections. In this case it looked as if the method would work, and it has. I examined him last week. It is almost two years since his injections were started and well over a year since they were finished. He has abandoned his truss, and is now regarded as our best "injection case" from that standpoint. However, he complains of extremely marked impotence, but this, I think, must be largely psychic as I cannot conceive of the injections causing impotence even though the patient claims they have. At the same time he complains of pain in the groin and in the area of the injection, as well as slight atrophy of the testicle, and a little lump above his testicle. Examination reveals what may be a very small hydrcele, or possibly a varicocele. It is this swelling above the testicle to which the patient takes exception. He is in a very ugly frame of mind, and is constantly being referred to me by the claim department. They have also referred him to Dr. McNeill (our President today) and he has examined him and reported much the same findings as we have. Last week he was in, and he is ready to make trouble for the railroad, even though he is the best result we have thus far obtained with the injection method.

We had another case, complaining of impotence.

Thus our present view of this method is very much like Dr. Kelly's. We do not stand here to condemn it unreservedly, but we have stopped using it at the Hospital for Ruptured and Crippled, and we do not think we will take it up again. We feel that we have done as much pioneering work in this field as we care to do, that is, until some solution has been found, such as Dr. Kelly has visualized for us, which will produce proliferation and will hold it without absorption. Even then I doubt if we will ever deem it practical to use the method when dealing with femoral or direct inguinal hernias, but will probably reserve it for hernias of the simple indirect type.

Autotransfusion

—A Case Report—

By HOWARD O. SMITH, M.D., F.A.C.S.,
Marlin, Texas

L.N., No. 506, a muscular white boy, aged 19, was brought to the hospital at midnight of February 23, 1935. During a fight out in the country some 45 miles distant from the hospital, he had been stabbed with a long pocket-knife blade through the left abdomen. He was seen at home by his physician who gave him one-fourth grain morphine, and atropine 1/150, placed a sterile dressing over the wound, strapped it tightly with adhesive, and had him sent to the hospital at once. There was very little external bleeding.

On arrival, after a one-hour trip in a sedan, the patient was immediately taken to the operating room and the dressing removed. A stab wound about two inches long, into the left hypochondrium just beneath the point of the tenth rib, was seen with some bright blood oozing from it and a portion of omentum protruding through. There was practically no external bleeding. His blood pressure was: systolic—60, diastolic—50; his pulse rate,

60, was counted with the stethoscope at the cardiac apex, but it could not be counted at the wrist. While the patient was being prepared for incision, he was given 1000 cc. of glucose 5% in saline and and 500 cc. of a 1.5% gum acacia mixture. Following this, another 500 cc. of 5% glucose in saline were given slowly intravenously. His pulse began to increase somewhat in strength but remained 60 to 64. He was then given another one-fourth grain of morphine, and 1/150 atropine as he seemed to be in great pain, and was given nitrous oxide induction and a very light ether analgesia. A left pararectus incision was made, with a debridement of the area about the stab wound. On opening the abdomen, there was a tremendous gush of blood, 1000 cc. of which were saved by simply dipping it out with small granite basins which were available at the time. This was immediately filtered through eight layers of sterile gauze into an ordinary glass infusion container and re-injected into the patient's vein. The blood was diluted with enough normal saline solution to enable it to run through the tubing rapidly; no sodium citrate was used, and there was no clotting. The patient's condition began gradually to improve, and it was found there were two small arteries bleeding from the internal surface of the abdominal wound, also one vessel in the omentum which was bleeding profusely and filled the abdomen with blood. No other damage was done. The area was closed with one Penrose drain, and his condition was considered fair as he left the operating table.

After this the patient continued to improve. His temperature reached 102 on the morning following the operation, but gradually subsided, and he was dismissed on his 16th day, with the incision healed except for one small area down to the fascia through which the Penrose drain had been placed. He was seen on October 15, 1936. He has been doing heavy farm and ranch work, has had no further trouble, and has no hernia.

In this instance, I feel that an autotransfusion probably saved the patient's life, as it would have taken us fully 30 minutes to have secured and tested a suitable donor, and the infusions of glucose and saline and gum acacia mixture were not enough to sustain life, as he had had such profuse bleeding. There is not much about autotransfusion in the American literature. Charles M. Watson and James R. Watson recently reported two cases, with 272 subject references.*

Dermatitis

By Louis Tulipan, M.D.,
New York City

IT HAS been known for many years that an oil derived from the cashew nut is a powerful skin irritant, and may produce an eruption similar to that caused by the rhus group. The earliest medical report was that published by Taylor, of Guy's Hospital, in 1875.[1]

The cashew tree is a native of tropical America but has been naturalized in Africa and the East Indies. These two types are called *anacardium occidentale* and *orientale*. The East Indian variety is called the "Indian marking nut" because the oil from the nut colors the skin black. The oil is obtained from the rind or mesocarp of the nuts, and turns black on exposure to the air. The active principle is a yellowish oil called cardol which is so caustic that it has been used to remove warts, corns, etc.[2] Newbauer[3] and Tanton[4] have studied the local and constitutional effects of cardol.

Substances long known for their irritating properties may be introduced into modern industrial processes and give rise to an occupational dermatitis the cause of which may be totally unsuspected. The case which I report here occurred in a young man of 20 who worked in a laboratory where investigations were being conducted on the use of cashew nut oil as a vehicle for printer's ink.

M. T., a white male of 20, worked with cashew nut oil in a commercial laboratory on October 24, 1936. That evening, an eruption of itchy water blisters appeared on several of his fingers. Two days later a similar rash broke out on both hands, and on forearms, arms, face and knees. Three other men working in the same laboratory had similar but milder eruptions.

On examination, the patient presented irregular groups of minute vesicles on an erythematous base, located on the dorsal of all the fingers and both hands. There were confluent sheets of tense, pinpoint vesicles on a scarlet red base on the volar surfaces of both forearms extending from the wrists to the elbows. The extensor surface of the left forearm was also involved in like manner. On the chin and lips there were irregular, erythematous, scaly patches. On the inner side of each thigh, above and below the knees, were irregular patches of small crusted papules on a pink, erythematous base. A patch test performed on the arm with a highly diluted alcoholic solution of dark cashew nut oil was strongly positive to the point of vesiculation.

It is highly probable that a printer's ink prepared with cashew nut oil as a vehicle would provoke varying grades of dermatitis, not only in printers handling the ink but also among many persons handling the printed sheet. In such cases the insidious nature of the irritant might well go unsuspected unless especially considered by the dermatologist investigating such a dermatitis.

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Edema

By Gordon B. Myers, M.D.

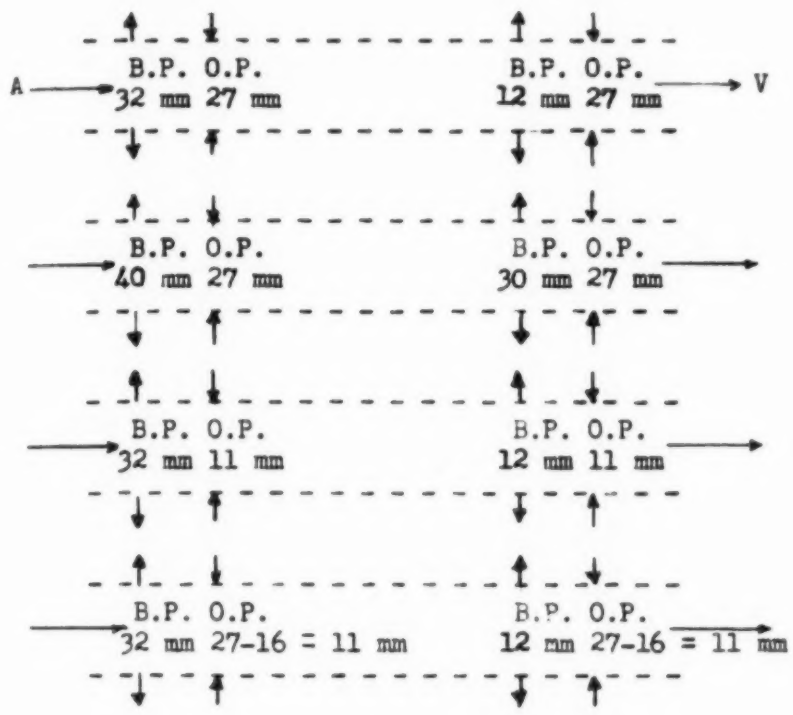
DURING the last 10 or 15 years there have been a number of important contributions to our knowledge of the pathogenesis and treatment of subcutaneous edema.* I propose to review the modern concept of the pathogenesis of edema and point out its practical application in diagnosis and treatment.

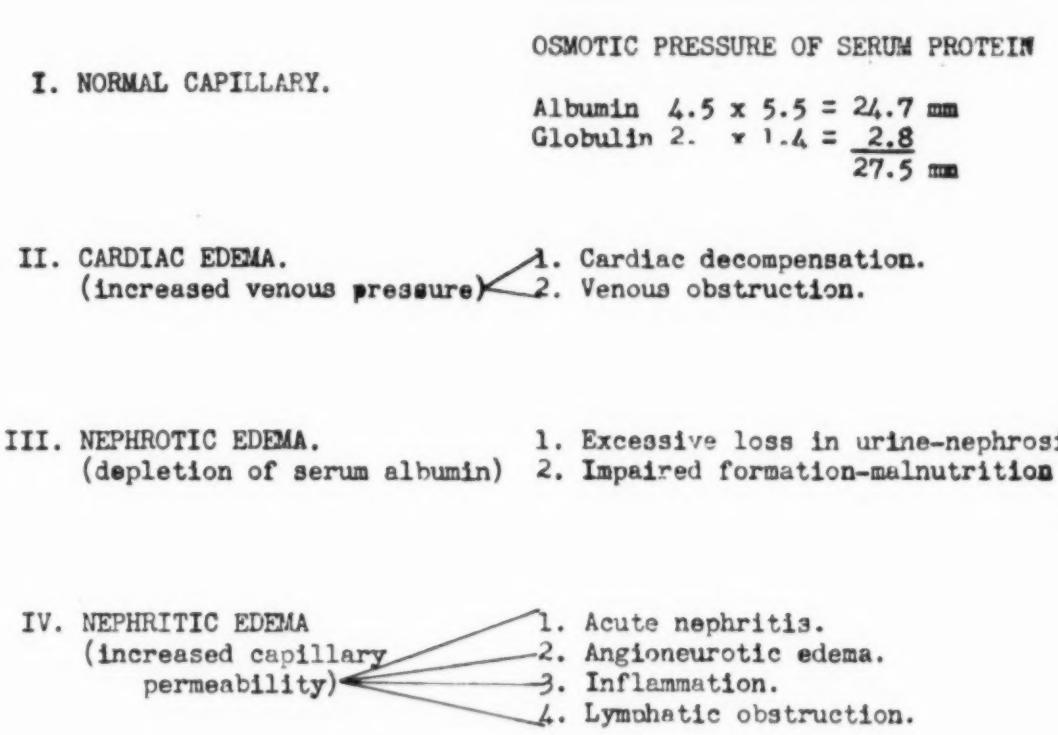
THE illustration represents a normal capillary, the arterial end at the left and the venous end at the right. The endothelial cells of the capillary

* From the Department of Internal Medicine of Wayne University; presented at the Thirteenth Annual Meeting of the Association of Surgeons of the New York Central System, Detroit, Michigan, October 15, 1936.

wall are represented by dashes. The spaces between these endothelial cells are large enough to permit the free passage of water and salts in either direction, that is, from the capillary out into the tissue spaces or from the tissue spaces back into the capillary. The serum proteins (albumin and globulin), on the other hand, are larger molecules and are unable to pass through the capillary wall.

There are two factors which determine the direction in which the water and salts will pass. The first factor is capillary blood pressure, the effect





BLOOD SERUM Albumin 4.5 x 5.5 = 24.7
Globulin 2. x 1.4 = 2.8
27.5
TISSUE FLUID Albumin 3. x 5.5 = 16.5
Effective osmotic pressure= 11 mm

of which is to force water and salts from the capillary out into the tissues. It has been possible to measure the blood pressure in the fingernail capillaries by inserting a very small canula, under the microscope, into the capillary and recording the blood pressure with a mercury manometer. The average blood pressure in the arterial end of this capillary is 32 millimeters of mercury, whereas the average pressure at the venous end of the capillary is 12 millimeters. The second factor governing the direction which the water and salts will take is the osmotic pressure exerted by the serum albumin and globulin. Protein has the power to attract water, which is spoken of as osmotic pressure, and consequently, will draw water and salts from the tissues back into the capillaries. The average osmotic pressure lies in the neighborhood of 27 mm. of mercury, and is largely due to the serum albumin, which determines about 24 mm.

At the arterial end of the capillary, the blood pressure exceeds osmotic pressure, and consequently, water and salt are forced out into the tissues. At the venous end, however, due to the fall in blood pressure, the osmotic pressure normally exceeds the blood pressure and, as a result, water and salts are drawn back into the capillary.

Edema occurs whenever the pressure relationships at the venous end are reversed so that the capillary blood pressure exceeds the osmotic pressure.

Fluid and salt will then pass out of the capillary at the venous end as well as at the arterial end, and will accumulate in the tissues, resulting in edema. Reversal of pressure relationships at the venous end of the capillary may occur either through elevation of the capillary pressure or lowering of the osmotic pressure.

Elevation of capillary pressure occurs whenever there is an obstruction in the venous circuit as, for example, in thrombophlebitis. As a result of a clot of blood in a large vein there is an obstruction of all distal tributaries, which is transmitted to the venous ends of the capillaries, causing the rise in capillary blood pressure. In cardiac decompensation, the increased pressure in the right auricle is transmitted to all veins and capillaries lying below the heart, the amount of increase being directly proportional to the vertical distance below the right auricle. The edema of thrombophlebitis is easily recognized by its unilateral distribution and by the associated changes in the vein. The edema of cardiac decompensation is readily recognized by its strictly dependent distribution. When the patient is ambulatory, the edema will be greatest in the ankles and lower legs; when bedridden, the edema will be most marked over the sacrum and posterior aspect of the thighs. The face is ordinarily not involved because the dyspnea necessitates assumption of a sitting posture.

The second type of edema (nephrotic) is due to a fall in osmotic pressure through depletion of serum albumin. Whenever the serum albumin falls from its normal level of 4.5% to 2.5% or below, pressure relationships may be reversed at the venous end of the capillary and edema may form. The low serum albumin may be due to marked albuminuria (as in nephrosis or subacute glomerulo-nephritis) or to a diet deficient in protein. The latter occurred among Austrian and German civilians during the World War, and is at present encountered in cachectic states and in patients kept upon a low protein diet for long periods.

This type of edema is recognized by the fact that it not only involves the dependent parts of the body, but also affects the face, manifested by puffiness of the eyelids and cheeks. This edema, in contrast to the next type about to be considered, is a long-standing edema, usually lasting for months. The diagnosis may be confirmed by finding a serum albumin level below 2.5%.

The third type of edema (nephritic) is due to capillary damage rendering the wall permeable to albumin. The osmotic pressure of the albumin escaping into the tissue spaces partially neu-

tralizes the osmotic pressure of the serum albumin, thus bringing about a reversal in pressure relationships at the venous end of the capillary.

This type of edema occurs in acute nephritis as a result of capillary damage by a toxin disseminated from a focus of infection. It likewise involves the face as well as the dependent parts but differs from the nephrotic type in that it is transient.

Angioneurotic edema also falls under this category, the capillary damage being due to a specific protein to which the patient is sensitized. Angioneurotic edema is recognized by its sudden onset, patchy distribution and associated urticaria.

Inflammatory edema is likewise due to capillary damage but is easily recognized by the associated redness and increased heat.

The edema of lymphatic obstruction also falls in this group. Lymph normally contains 2% to 3% protein. When dammed back into the tissue spaces it partially neutralizes the osmotic pressure of the serum albumin, thus producing pressure reversal and edema.

Reversal in pressure relationships at the venous end of the capillary, due either to a rise in capillary blood pressure or fall in osmotic pressure, is necessary for the production of edema. The amount and distribution of edema are affected by several other factors. The most important of these is the salt intake. The more salt ingested, the greater the edema. The edema-forming element in salt is the sodium ion as shown by the fact that other sodium compounds (such as the bromide, bicarbonate, etc.) behave similarily to compound salt whereas certain chlorides (such as potassium or ammonium chloride) are valuable diuretics.

A second factor influencing the amount of edema is the reaction of the dietary ash. Dehydration is associated with acidosis and edema occurs in alkalosis. Vegetables, fruits and milk furnish an alkaline ash, whereas meat, eggs and cereal leave an acid ash. The reaction of the diet as a whole will depend upon the proportions of these two classes of foodstuffs. If alkaline, edema will be increased, if acid, it will be reduced.

The distribution of all types of edema is influenced by posture. Edema is usually greatest in the lower legs of ambulatory patients and over the sacrum and backs of the thighs of bedridden cases. Since patients with nephrotic and nephritic edema are usually able to lie flat, the face is also involved.

Tissue pressure also influences the distribution of edema. Even when the legs are markedly swollen, there is little or no edema of the soles of the feet due to the tight adherence of the skin. The looser the tissue, the more readily edema will accumulate.

Treatment

DIET: Whenever lowering of serum albumin is a factor in the edema, it is important to prescribe a high protein diet. The average person will not be able to tolerate more than 120 grams daily. This may be provided by including one pound of meat in the daily menu.

The diet should furnish an acid ash. A high protein diet will almost always leave an acid ash. When low protein diets are prescribed, an acid salt such as ammonium chloride should be given.

A salt-poor diet is essential and may be attained by adhering to the following rules:

1. No salt should be added to the food in cooking or at the table;
2. Obviously salty foods must be eliminated (salted meat, fish, crackers, nuts, etc.);
3. Salt free bread and butter must be used;
4. Milk should not be used in large quantities;
5. No drugs containing sodium should be prescribed.

If the foregoing precautions are followed the diet will be low in salt, since most food is inherently salt poor. A salt substitute will usually be needed to make the diet palatable. Potassium chloride tastes much like table salt, and is, in contrast to sodium chloride, a valuable diuretic. It may be placed in a salt shaker and used as desired by the patient.

If it were possible to provide an absolutely sodium free diet, fluids could be given liberally without increasing edema. Since it is impracticable to provide such a diet clinically, it is advisable to restrict fluid intake to 1500 cc. daily.

DIURETICS: There are three principal groups of diuretics in use at the present time, the acid forming salts, the xanthine compounds and the mercurials. The only contra-indication to the use of diuretics is renal insufficiency. Under these circumstances drugs are not eliminated efficiently and may be retained in sufficient amounts to produce poisoning.

The acid-forming salts, represented by ammonium chloride and ammonium nitrate, cause diuresis through the production of acidosis. Ammonium nitrate is less unpleasant to take but sometimes causes cyanosis by reducing hemoglobin to methemoglobin. If the drug is stopped promptly, the cyanosis will clear up quickly and no serious difficulties will be encountered. Ammonium chloride and nitrate are ordinarily prescribed in aqueous solution in doses of 30-50 grains tid p.c. for three to seven days. If the patient strenuously objects to the taste of the aqueous solution, the drugs may be put up in capsule form.

The xanthine group cause diuresis by increasing blood flow through the glomeruli. Since all of the drugs in this group are more or less irritent to the stomach, they should be taken after meals. It is best to prescribe them after breakfast and the noon meal so that diuresis will not interfere with sleep. The most efficient diuretic in this group is theocin, given in five-grain doses bid. Other useful members of this group are aminophyllin grains 3-4½, diuretin grains 10-15 and phyllicin grains 4-8. It is customary to administer these drugs for periods of three days, separated by rest intervals of one or two days. When theocin begins to lose its effect, another of the xanthine derivatives may be substituted.

The organic mercurials are the most effective diuretics and probably act by interfering with resorption of water in the tubules. They are preferably administered intravenously but may also be given intramuscularly. Care must be taken to avoid leakage into the subcutaneous tissue because a slough will result if these drugs are given under the skin. The most widely used preparation in this group is salyrgan, the initial dose being .5 cc. intravenously.

Subsequent doses of .5 to 2 cc. may be given every three to seven days.

The best results are obtained by starting the patient on an ammonium salt together with theocin, giving salyrgan on the third day. After a day's

rest the ammonium salt is resumed together with another of the xanthine group, and the second dose of salyrgan is given on the seventh day. The effect of one diuretic enhances that of another, probably because of their different modes of action. A considerably greater diuresis is obtained by giving all three groups of drugs simultaneously than by giving each separately.

A chemical combination of theophylline with an organic mercurial was introduced recently under the name mercurpurin. It is given intravenously in the same dose and in the same manner as salyrgan. Preliminary reports indicate that it is superior to salyrgan.

DIGITALIS: Whenever congestive heart failure is responsible for the edema, the patient should be digitalized. The oral preparations are just as effective and almost as prompt as the parenteral preparations. Since the latter are expensive and since they are irritating when given subcutaneously, they are only indicated in patients unable to swallow or in very critical cases. For oral administration, the powdered leaf is preferable to the tincture because it is more stable and easier to take.

The average total dose required for digitalization is .1 gram (1½ grains) per 10 pounds body weight. When rapid digitalization is desired, one-half of the calculated dose (but no more than .7 gram in any person) is given at once, followed by one quarter of the calculated total six hours later. Provided that no symptoms of over-digitalization have appeared, the two remaining eighths are given at intervals of six hours. These doses must be modified in patients who had received digitalis within two weeks, to allow for accumulative effects.

Full digitalization is indicated by diuresis and improvement in dyspnea and, in the presence of auricular fibrillation, by a fall in apical rate to between 60 and 70. When the rhythm is regular, therapeutic doses of digitalis have little effect on the rate. Over-digitalization is indicated by the development of anorexia, nausea, vomiting and coupled apical rhythm. If the desired therapeutic effects are obtained, the patient is placed on a maintenance dose of digitalis, which averages .1 gram (1½ grains) daily. It may be necessary to make readjustments in the maintenance dose to suit individual needs, but it is essential that the proper dose be continued for the remainder of the patient's life. In the event of over-digitalization, the drug should be stopped until the symptoms have subsided and should then be resumed in smaller doses. In case the therapeutic effects of digitalis have not been obtained, one should continue with .1 to .2 gram (1½-3 grains) every six hours until the full effects are evident or toxic symptoms appear.

MECHANICAL REMOVAL OF FLUID: Pleural fluid will usually not be reabsorbed and must be removed by thoracentesis. A marked ascites interferes with kidney function through compression of the renal vein and must be removed mechanically. Small to moderate collections of ascites may often be removed by diuretics. When subcutaneous edema is refractory to all of the foregoing measures, Southey tubes may be inserted as a last resort. These are small metal tubes one to two centimeters in length and one to two millimeters in diameter. It is customary to insert one tube on the medial and lateral aspects of the most dependent part of each lower extremity. A surprisingly large volume of fluid will escape through these small tubes in 24 hours and intractable edema will frequently be removed. It is important to use strict aseptic precautions in inserting the tubes and to keep them covered with sterile dressings because of the danger of cellulitis.

PURGATION AND SWEATING are not advisable because they are not nearly as efficient in removing fluid as the foregoing measures and because they weaken the patient.

Vaccinotherapy

For the Prevention of Colds

By R. D. MUDD, M.D.,
Saginaw, Michigan

THE value of vaccines for the prevention of colds and their complications has been the source of considerable speculation in recent years. Statistics can be shown to prove that colds can or cannot be prevented or benefitted by vaccine. Others attempt to show that the severity, amount of lost time and number of complications of colds are affected by vaccine. Space will not permit a review of the voluminous literature on this subject.

As Medical Director for a group of about 1,000 men at Norwood, Ohio, I was impressed during the winter of 1934-35 with the large number of severe colds and their complications occurring among this personnel, including those in executive capacities. With the intention of improving this situation and at the same time determining for myself the practical value of cold vaccine, one of the stock vaccines, Abbott's M. Catarrhalis Bacterin, was offered to those employees who wished to accept it. No compulsion of any type was exercised and no attempt was made to over sell the doubtful value of the treatment and that the vaccine would be given on their own responsibility. As a result 233 employees presented themselves for vaccinotherapy. The plan was to give each patient three injections of ¼, ½ and 1 cc. on succeeding Fridays (the last working day of the week). Some patients with particularly bad histories were given additional injections and some received an additional injection or more when they felt that they might be contracting a cold. Those with colds were not vaccinated. No case of infection or soreness of the arm needing observation or treatment was reported. The needles and syringes were sterilized by boiling and were transferred from the boiling water to an unheated antiseptic solution, (Phemerol, an experimental P.D. preparation, used 1:10 strength) where they remained until used. The injection site was prepared by application of tincture of Metaphen. The treatment was begun in October, 1935, and continued until the early part of February, 1936. Records were kept for approximately eight months of all lost time occurring in the vaccinated and also among a non-vaccinated group of 200 picked at random. In addition to this a questionnaire was presented to each one of the vaccinated group in the latter part of August, 1936.

This questionnaire, which was answered by all but 18 of the vaccinated group, was as follows:

1. Do you feel that the cold vaccine you received last winter helped you?..... (Yes or No).

2. How many colds did you have for the four months following the injections?.....

3. Did you have colds more often during the previous winter?.....(Yes or No).

4. Do you think the injections lessened the severity of your colds?.....(Yes or No).

5. Would you think that it would be worth while to repeat the cold vaccine this coming winter? .....(Yes or No).

The questionnaire was answered by 215; and 133 of these received the vaccine according to the original schedule, 50 received more than three injections, 20 stopped treatment after receiving two injections, and 12 stopped after one injection. In studying these replies, those who received *three or more injections* were considered as a group and designated Group "A". This group was subdivided into "A1" and "A2," as per the tables below. Those receiving two injections were classed as Group "B", and those receiving but one injection were designated Group "C". The replies received are shown in Tables 1, 2, 3 and 4.

Ques.	Yes	%	No	%	No Answer	Miscellaneous
1	118	88.7	13	9.8	1	Don't know—1
3	81	60.9	46	34.5	4	Same —2
4	113	84.9	12	9.	7	Probably —1
5	120	90.2	11	8.3	2	

Table 1. Group "A" Patients, Who Received Three Injections According to Schedule (Group "A1")

No. of Colds	0	1	2	3	4	5	6	7	8	9	10	Few	Plenty	Cont. Cold	No. Answer
No. of Patients	45	43	15	4	3	3	2	0	0	0	1	1	1	2	13
Percentage	33.9	33	11.3	2.3	2.3	2.3	1.5	0	0	0	8	8	8	1.5	10

Table 2. Number of Colds Among Those Receiving Three Injections as per Schedule (Group "A1")

Ques.	Yes	%	No	%	No Answer	%	Miscellaneous
1	45	90	5	10	3	6	Don't know —1 Same 1
3	33	66	12	24			
4	43	86	3	6	2	4	Perhaps some—1 Don't know —1
5	48	96	2	4			

Table 3. Replies of Those Receiving More than Three Injections (Total 50)

No. of Colds	0	1	2	3	4	5	6	7	8	9	10	Few Yes	Several	No Answer
No. of Patients	14	14	10	2	2	0	0					3	1	3
Percentage	28	28	20	4	4							6	2	6

Table 4. Number of Colds Occurring Among Those Receiving More than Three Injections (Group "A2")

If the analysis of these two groups designated "A1" and "A2" could be taken as a criterion, the conclusion as to the value of the vaccine would indicate considerable success in the prevention of colds and their complication: 88.7% of Group "A1" and 90% of Group "A2" (an average of 89.4%) felt that they were benefitted by the vaccine; 60.9% of Group "A1" and 66% of Group "A2" (an average of 63.5%) felt that they had more colds in the previous winter than during the 1935-36 season when they received their vaccine; 84.9% of the first group and 86% of the second (an average of 85.5%) felt that the severity of their colds was lessened as compared with the previous winter. It is interesting to note that an average of 93% wished to have the vaccine repeated in the 1936-37 season.

One of the Group "A" patients died; his physician diagnosed the case as pneumonia. I examined this patient two days before his death and found no evidence of pneumonia. He had severe vomiting and other signs and symptoms that suggested G. I. pathology. The number of patients claiming to have no colds for four months following their injection was 33.9% in the first and 28% in the second group, an average of 31%. How this percentage compares with unvaccinated groups I do not know. It has been my experience however, that the average person will have some kind of cold or its complication in four months.

Several questions arise at this point. One is whether or not the severity of colds in general and their frequency was different in the 1934-35 season as compared with the 1935-36 winter season. To obtain some information on this question I corresponded with Dr. F. K. Harder, Acting Commissioner of Health of the City of Cincinnati, who replied as follows: "There is no way of keeping a record of colds from which the general population of a large city suffers. My general impression from my personal observations and contacts is that there was practically no difference in the general incidence of colds in the winters of 1934-1935 and 1935-1936. Perhaps some approximation as to the relative incidence of colds can be gained if we assume that deaths from pneumonia parallel to some degree, the incidence of colds. From October, 1934, through May, 1935, inclusive, there were 325 deaths from lobar pneumonia and 117 deaths from bronchopneumonia, making a total of 442 deaths. From October, 1935, through May, 1936, inclusive, there were 329 deaths from lobar pneumonia and 157 deaths from bronchopneumonia, making a total of 486 deaths."

Another question is whether or not the employees' memories were accurate and whether or not their desire to get free vaccination during the coming winter prompted them to give favorable replies. To throw some light on this last point a study was made of those receiving two injections (Group "B") and those receiving one injection (Group "C"). The conclusions to be drawn from these groups are not definite, inasmuch as the reasons for discontinuing the treatment are not given. It is conceivable that these groups started the treatment without determining in their own minds their need for the treatment and after receiving their first or second injection decided not to continue. If this were the case any good results claimed by the employees might be attributable to a good resistance.

Ques.	Yes	%	No	%	Miscellaneous
1	17	85	3	15	
3	9	45	10	50	Don't know—
4	15	75	3	15	Same —
					No answer —
5	18	90	2	10	

Table 5. Group "B"; Those Receiving Two Injections o ¼ and then ½ cc.

As was stated above the replies of the group cannot be relied on, but if a majority felt that their two injections helped them, then they would either be mistaken or the two injections might have done some good. For example, 75% thought the severity of their colds was less as compared with an average of 85.5% in the first two groups, and 85% thought the vaccine helped them generally as compared with an average of 89.4% in the first two groups. The replies to Question 3 as to frequency of colds approaches what one would expect to be the true facts. The replies show that 50% felt that the number of colds in 1935-36 season was greater or at least the same as the 1934-35 season as compared with an average of 29% in the first two groups; 16 of the group of 20 indicated the number of colds they had for four months after their injection (four did not answer Question 2). The 16 had 19 colds, or an average of 1.19 colds per man, as compared with 1.15 colds among 158 employees who answered Question 2 in the first two groups.

The replies of Group "C" are given for what they are worth (Table 6). One could not expect any benefit from one injection unless it was psychic.

Question	Yes	No	No Answer
1	11	0	1
3	5	5	2
4	10	1	1
5	11	0	1

Table 6. Replies of Group "C"; Those Receiving One Injection

The replies of this group, although small, throw further doubt on the value of the questionnaire. Eleven, or 91.7% (89.4% in the first two groups) felt that the vaccine helped them; 10, or 83.3%, (85.5% in the first two groups) felt that their severity was lessened—very little different from the "A" groups who were given seven times or more vaccine. The questionnaire would seem to be somewhat accurate with regard to frequency, the replies to Question 3 being similar to those of Group "B." Seven in this group who answered Question 2 report an average of 1.43 colds, which indicates that this group would have approximately one more cold per year than the first two groups.

TO GET back to Group "A", which is the important group, an analysis is made of the various replies with relation to one another: 18 stated they were not benefitted by the vaccine. Of these, three had one cold each, one had two colds and one had two or three colds, two had four colds, one had five or six colds, one had six colds, and one 10 colds. One simply said he had "colds"; one said he had "plenty"; three did not answer the question, and two had "continual colds." Ten said they did not have more colds in 1934-35 winter; five had more colds in 1934-35; two had the same number in both winters, and one did not answer. Thirteen said the severity of their colds was not lessened; three thought it was, including one who was not sure; one did not know, and one did not answer. Thirteen would not take the treatment again, and five would. Some interesting conclusions can be drawn from this group. In the first place it is worthy of note that there was a total of 13 who indicated that they would not take the vaccine again, and examination of the records shows that all of these claimed they were not benefitted by the vaccine. No one who claimed to be benefitted by the vaccine refused to be revaccinated during the following winter. Five of this non-benefitted group and all of the benefitted group expressed a desire to be revaccinated. The average of colds of the non-benefitted group (i.e. those who gave an estimate) was 3.6 colds per man for four months. The general average for the remainder of "A" groups (excluding those who did not state a definite number of colds) was .88 colds per man. In other words, 151 patients who said they were benefitted had an average of .88 colds per patient for four months, and 10 who said they were not benefitted had an average of 3.6 colds. We had no way of knowing whether or not this latter group is unusually susceptible.

Another interesting point in connection with the "A" group concerns the opinion as to severity of those who thought they had the same number or more colds in the winter of 1935-36 than the prior one, by answering "No" or "Same" or "None" to Question 3. There were 60 in this group; 48 said they were benefitted, 11 said "No", and one did not know; 50 said the severity of their colds was lessened, seven said it was not, two said it probably was, and one did not answer. Forty-eight of this group gave their estimated number of colds, the average being 1.28 colds per person. Seven did not answer; two said their cold was continuous, and three answers were equivocal. Fifty-five of the 60 wanted the vaccine again. The records showed that where the number of colds was not lessened, 83.3% said the severity was less, and 91.7% would be revaccinated.

Further study of those in Group "A" who said they had no colds after receiving vaccine elicited the following: All of the group indicated that they were benefitted by the vaccine; 40 said they had colds in 1934-35 season, and 18 said they did not. All of the group wanted the vaccine again excepting two who did not answer this question.

As mentioned above, records were kept of the lost time for approximately eight months after vaccination, of all those given vaccine as well as of a group of 200 who did not receive vaccine. These were grouped into "A", "B" and "C" groups as above. In "A" group 194 patients who received three or more injections as per dosage stated above lost a total of 156½ days, of which 4½ days were due to unknown causes, leaving a total of 152 days lost.. This is an average of .78 days per employee for eight months. The time lost and the reasons therefor are given in the patient's words (Table 7.)

	No. of Disabilities	No. of Days Lost	Average Per Case
Colds	16	26	1.6 days
Bronchitis	2	1	5
Flu grippe	10	61	6.1
Intestinal grippe	2	2½	1.3
Tonsillitis	4	17	4.3
Pneumonia	1	32	32
Pleurisy	2	4	2
Infected ear	1	9	9
Unknown	4	4½	3.6
	42	156½	3.7

Table 7

Number of disabilities per member of Groups "A1" and "A2": .21.

The unvaccinated group of 200 employees taken at random (alphabetically) and which were used

as a check against the vaccinated group lost time from January 1 to September 1, 1936, as per Table 8.

	No. of Disabilities	No. of Days Lost	Average Per Case
Colds	24	40	1.6 days
Grippe	9	28	3.1
Tonsillitis	1	4	.4
Pneumonia	3	46	15.3
Pleurisy	2	2½	1.3
Infected ear	1	26	26
Sinusitis	1	½	.5
Sore throat	1	2	2
	42	149	3.5

Table 8.

Number of disabilities per employee: .21. This loss of time amounts to .75 days per employee for eight months as against .78 days in the "A" Groups.

In order that the vaccinated and non-vaccinated group can be compared more fully a comparison of the two groups with respect to the number of visits to the hospital for minor medical care of any type is shown.

The visits to the plant hospital for minor medical treatment (Table 9) include headaches, heartburn, constipation, minor pains and aches, etc., in addition to colds and their complications.

	Visits to Plant Hospital for Minor Medical Treatment	Average Per Case
Vaccinated (Group "A1" and "A2") 194 Employees	446	2.3 visits
Unvaccinated Group 200 Employees	268	1.3 visits

Table 9.

Thus it seems that there is considerable variation between the statements of the employees contained in the answers to the questionnaires and the actual facts as determined by the records kept. How to account for this I do not know. It is true that the questionnaire does not pertain to disability directly, and furthermore the average employee does not associate influenza, ear infections, pneumonia and the other complications of colds, with colds themselves and probably was not thinking of these complications when referring to severity and frequency of colds. It would seem that the number and severity of colds were less without there being a diminution of lost time due to colds and their complications. An employee with a cold is a burden on plant production even if he does not lose time, and the burden is greater according to the severity and duration of the cold. An improvement in the cases that do not lose time would be welcome. Another interesting point is that the non-vaccinated group may have benefitted by diminished exposure to colds, as approximately 25% of the plant personnel were vaccinated and it is probable that those who were most subject to colds would be the ones most likely to request the treatment.

SUMMARY: 1. Of 233 employees who requested vaccinotherapy for preventive purposes, 194 completed the treatment, and 183 of these replied to a questionnaire.

2. The replies indicated that 89.4% felt that the vaccine helped them; 63.5% felt that they had more colds in the previous winter for a corresponding period; 85.5% felt that the severity of their colds was less, and 93% wished to be vaccinated in the following winter; 31% had no colds for four months after their treatment.

3. Similar results were obtained on the questionnaire of those who received but one or two injections and then stopped. These groups were small but tend to throw some doubt on the value of the questionnaire for determining the results of the experiment.

4. Records of lost time and the reasons therefor were kept on the vaccinated group as well as a group of 200 non-vaccinated employees. There was found to be practically no difference in the two groups so far as amount of time lost, number of disabilties per employee, and duration of illness per disabilty. One of the vaccinated group died of what his doctor said was pneumonia, several months after vaccination.

5. The vaccinated group visited the plant hospital for minor medical care more often than the non-vaccinated group.

6. The reasons for the apparent disagreement between the results of the questionnaire and the actual time lost are discussed.

Central States Society

THE Central States Society of Industrial Medicine and Surgery is holding its Annual Mid-Winter Scientific Meeting on December 4, 1936, with the following program arranged by Dr. James H. Finch, Champaign, Ill., and Dr. Arthur H. Conley, Chicago, Co-Chairmen of the Program Committee:

All-Day Session Cook County Hospital

Forenoon—9 A.M. to 12 M. (20 Minutes Each)

1. Demonstration of New and Improved Fracture Apparatus, by Dr. John Gaynor, Chicago.

2. Tumor of Bladder in Relation to Industry, by Dr. Donald Hibbs, Chicago.

3. Unusual Injury to Ureter, Complicated by an Ectopic Kidney, by Dr. Wm. J. Carter, Mattoon, Illinois.

4. Trauma in Relation to Mental Disturbances, by Dr. Francis Gerty, Chicago.

5. Traumatic Heart Disease, by Dr. C. C. Maher, Chicago.

6. Secondard Hemorrhage from Rupture of the Spleen, by Dr. Geo. L. Apfelbach, Chicago.

7. Prognosis of Hip Joint Fractures, by Dr. W. Eugene Wolcott, Des Moines, Iowa.

Afternoon—1:30 P. M. to 4:30 P.M. (20 Minutes Each)

1. Treatment of Fractures of the Neck of the Femur, by Dr. J. J. Callahan, Chicago.

2. Injection Tretament of Herniae, by Dr. Don Deal, Springfield, Illinois.

3. Treatment of Perforative Peritonitis, by Dr. Karl A. Meyer, Chicago.

4. Differential Diagnosis of Hysteria, Malingering and Organic Nervous System Pathology, by Dr. T. T. Stone, Chicago.

5. Emergency Treatment of Fractures, by Dr. William R. Cubbins, Chicago.

6. Fractures of the Lower End of the Radius, by Dr. Ralph M. Carter, Green Bay, Wisconsin.

The Evening Meeting and Dinner will be at the Bismarck Hotel at 7 P.M. The guest speaker will be Thomas Angerstein who will talk on "The Illinois Occupational Disease Act."

The History of Industrial Medicine and Occupational Diseases

—An Historical Outline of Occupational Diseases, Industrial Hygiene and Surgery, Traced from Early Antiquity to the Great Depression of the Twentieth Century—

by

ROBERT T. LEGGE, PH.G., M.D., F.A.C.S.
Professor of Hygiene, University of California, Berkeley, Calif., Lecturer in Industrial Medicine, University of California Medical School, San Francisco; Lieut. Colonel, M.C., U.S.A.; Honorary Member American Association of Industrial Physicians and Surgeons; Permanent Member, U. S. Committee, International Congress of Industrial Diseases and Accidents; Fellow, American Medical Association; Fellow, American Association for Advancement of Science; Fellow, American Public Health Association

Industrial Surgery

EVERY industry, whether it be factory, mine, transportation, or even modern agriculture, has its special hazards and accidents. As modern inventions and chemical discoveries are developed, new occupational injuries are presented. While cuts, contusions and burns are general wounds that may take place outside industry, and are treated by general surgical principles, yet industry has found that the surgeon who practices in the industrial field and who is present at the plant is best able to treat such injuries, since he sees them early and so can prevent shock, hemorrhage and infection, which in turn lessens absenteeism and workingman's compensation. Furthermore, emphasis is put upon preventive surgery by safety measures, sanitation, first aid and health education.

Events Leading to Modern Surgery

BARON LARREY, Napoleon's surgeon, at his time believed surgery had reached its limitations. Those were the days of laudable pus, hospital gangrene amputations and deformities, with the ever present high mortality.

Louis Pasteur, the greatest genius France ever produced, was the Father of Bacteriology; his germ discoveries laid the foundation for modern medicine, surgery, and public health. His discoveries gave Lister the idea to apply the principle to surgery. He gave medicine vaccines and autotoxines. His students and co-workers rapidly discovered the organisms of the various causes of disease. Koch in 1876 discovered the causes of traumatic infection. In 1880 Pasteur himself discovered streptococcus and staphylococcus organisms, and Nicolaier in 1884 discovered tetanus bacillus, the principal organisms responsible for wound infection, commonly met in industrial injuries.

When Lemaire in 1860 pointed out the antiseptic properties of carbolic acid, he offered the bactericidal agent to Joseph Lister in 1867 to introduce antiseptic surgery. This great contribution laid the foundation of modern surgery and made it possible to perform operations safely for the relief of human suffering. Every field of surgery was developed and improved. The blessed Trinity of modern surgery is asepsis, anaethesia, and trained nursing.

The greatest discovery, second to Pasteur's, was the contribution which W. C. Roentgen made to the world in 1895 — the x-ray. This marvelous discovery elevated industrial surgery in fracture cases, the location of foreign bodies, and in the diagnosis of chest conditions as a result of dusty trades. The early operators in this specialty suffered from an occupational disease due to overexposure, which caused burns, malignancies and sterility.

It was these marvelous discoveries that made modern scientific surgery possible, and yet it is interesting historically how haemostasis and antiseptics developed and the evolution of such necessary armamentarium as sutures, antiseptics, bandages and splints that a surgeon requires.

Haemostasis

THE superstitious respect for blood from the early birth of mankind was difficult to disentangle after these thousand years between science and religion. Celsus proposed in amputations to use compression and styptics before ligation of vessels in hemorrhage, although Heliodorus gave the first account of ligation and torsion of blood vessels. Archigenes advised digital pressure by bandage, cold, astringents, torsion and ligature. John, of Vigo, 1514, used the cautery. Ambrose Pare, 1537, substituted the ligature for boiling oil. Morel, in the siege of Besancon, 1674, was first to introduce the stick into the upper bandage and twist the same to stop bleeding (tourniquet). Petit invented the screw tourniquet, and Esmarch the bandage tourniquet, in 1873. The forceps were used by Erasistratus, but the haemostatic forceps with a ratchet was introduced by Charriere in 1858. Pean, of Paris, in 1867 and Spencer Wells, of London, in 1872 popularized forci pressure, which is the modern procedure.

Anaesthetics

THE ancients used opium and alcohol to deaden pain. Hua T'O, the god of surgery, in China, was born 190 A.D. It is said he used an effervescing powder to produce numbness (anaesthesia). He did abdominal surgery and acupuncture. P. Dioscorides, a Greek surgeon in the service of Nero, 54-68 A.D., developed mandragora wine for deadening pain in surgical operations and cauterization.

Humphrey Davy discovered the anaesthetic properties of laughing gas, NO_2, in 1799.

Ether was first used as a general anaesthetic by Dr. Crawford W. Long, of Georgia, in 1842. W. T.

G. Morton, a Boston dentist, demonstrated its value to the medical profession at the Massachusetts General Hospital in 1846.

Sir James W. Simpson, of Edinburgh, employed the use of chloroform as an anaesthetic in obstetrics the following year.

Dr. H. Wells, an American dentist, in 1848 employed nitrous oxide in extraction of teeth.

Cocain was discovered by Anrep in 1879. Carl Koller, New York ophthalmologist, pioneered cocain anaesthesia in 1880. Dr. J. Leonard Corning, of New York, introduced the use of cocaine spinal anaesthesia in 1885.

Anoci-association, devised by George Crile, of Cleveland, in 1901, combines scopolamine, morphine, nitrous oxide and oxygen anaesthesia.

C. L. Schleich in 1894 introduced the infiltration method of local anaesthesia. Novocain, discovered by Einhorn in 1905, was employed by Balfour in 1913 in nerve-blocking.

Sutures

CELSUS, first century A.D., describes the ligature of ancient origin.

Galen, second century A.D., used hemp and silk cord for ligating.

Rhazes, the Arab, 900 A.D., describes the stitching of wounds by thread made by twisted intestine of the ox.

Ambrose Pare, 1510-90, used ligature to control hemorrhage.

Sir Astley Cooper, England's most popular surgeon, used absorbable sutures to ligate vessels in 1808.

Joseph Lister introduced antiseptic catgut in 1868 and devised chromic catgut as ligatures in 1876.

Antiseptics

ANTISEPTICS were used by the Egyptians in the process of embalming. Dominique Jean Larrey, 1766-1842, Napoleon's Chief Surgeon, used Labarraque's solution (chlorinated soda) for infected wounds. A form of this type of antiseptic was reintroduced into the Great War as Carrel-Dakin solution. This solution, used by the allied armies, was perfected by Alexis Carrel and H. D. Dakin at the Beaujon Hospital, Paris, in 1914. Joseph Lister introduced carbolic acid as an antiseptic in 1867 at Glasgow. Ernest von Bergman, the famous German surgeon, introduced corrosive sublimate antisepsis in 1877.

Bandages

CLAUDIUS GALEN, 130-201 A.D., Rome, developed the first bandage of which we have accurate record—the six-tailed bandage for head injuries—although bandages were mentioned in the Bible and much used in ancient Egypt. Pierre Joseph Desault, a French surgeon, 1744-1795, devised the Desault bandage for fracture of the clavicle. Alfred A. L. M. Velpeau, a Parisian surgeon, 1795-1867, introduced the Velpeau bandage for retaining the arm in fractures of the clavicle.

The figure-of-eight bandage, for supporting the lower jaw, was developed by John Rhea Barton, a Philadelphia surgeon, 1794-1871. F. von Esmarch, 1823-1909, of Kiel, introduced the triangular bandage in 1869, and one for standardizing surgical haemostasis in 1873.

Lewis Albert Sayre, a New York surgeon, 1820-1900, introduced the plaster of Paris jacket for the treatment of spinal curvatures and Potts' disease in 1876.

K. C. Gibson, a New York dentist, developed the jaw bandage which bears his name.

E. A. Martin, 1824-1884, an American, devised a roller bandage of soft rubber for compressions of a limb.

Splints

SPLINTS were used in antiquity, having been found on mummies in ancient Egyptian tombs, but some important splints from time to time have been developed by eminent surgeons to suit their particular needs. Some of these we will mention:

G. Dupuytren, a celebrated French surgeon, perfected a splint for Potts'.

F. H. Hamilton, orthopedist of Wilmington, Vermont, developed for fractured femurs the long splint which bears his name.

J. F. Hodgen, of Kentucky, 1826-1882, developed the wire suspension splint for the femur and elbow.

D. H. Agnews, of Philadelphia, 1818-1892, introduced a splint for fractured patella.

L. A. Sayre, 1820-1900, of New Jersey, introduced his knee splint.

R. Listens, a Scotch surgeon, 1794-1847, used straight splints of padded boards.

C. F. Taylor, German surgeon, 1830-1889, advocated the guttered splint with a foot attachment, which was perfected by R. Volkmanns.

Sir Robert Jones, of London, gave the world the cock-up splint for Colle's fracture.

Cabot perfected the wire splint.

Babcock's aeroplane splint was perfected for fractured arms and shoulders.

Carl P. Jones, of Grass Valley, California, invented the traction splint for fracture of the hip joint.

Organizations

IN 1917 the National Council of Defense appointed a Committee on Industrial Medicine. Since then other organizations and associations for the purpose of furthering industrial hygiene have been founded, among them the Board of Medical Examiners of the Red Cross. The two outstanding organizations in the United States that are contributing most toward the advancement of industrial surgery, are the American Association of Industrial Physicans and Surgeons, and the American College of Surgeons.

The objects of the American Association of Industrial Physicians and Surgeons are:

To foster the study and discussion of the problems peculiar to the practice of Industrial Medicine and Surgery; to develop methods adapted to the conservation of health among workers in industries; to promote a more general understanding of the purposes and results of the medical care of employees and to unite into one organization members of the medical profession specializing in the practice of industrial medicine and surgery for their mutual advancement in the practice of their profession.

The American College of Surgeons, since 1930 has conducted surveys in the United States to ascertain present medical conditions in industry and to inform employers of adequate methods to

deal with injuries, and rehabilitation of the injured. At their annual meetings a symposium is held on Industrial Medicine and Traumatic Surgery.

In the field of first aid, instruction to the injured, the American Red Cross and the U. S. Bureau of Mines have published two outstanding manuals; the one of the Red Cross was edited by Lieut.-Colonel Charles Lynch in 1910, and the manual of the Bureau of Mines, U. S. Department of the Interior, was compiled in 1928 by a committee of surgeons in the bureau.

Industrial Sickness and Accidents

INDUSTRIAL physicians and hygienists, and actuaries of insurance companies, have known by experiences and statistical studies that morbidity is higher among the workers, longevity in the years of life is lessened, and mortality increased, as a result of accidents, and occupational degenerative diseases.

The objectives of industrial medicine are fivefold: (1) to ascertain by examination the physical and mental fitness of the employee; (2) to ascertain work requirements and hazards in order to facilitate a proper placement of the worker; (3) to maintain and improve the health and efficiency of those already employed; (4) to educate the worker in accident prevention and personal hygiene; (5) to reduce lost time and absence from illness and injury.

The Balfour Committee of 1923-24 in England showed in its Survey of Industrial Relations that the entire labor of half a million persons was lost by sickness. According to German statistics, there are 40 cases of sickness each year for each 100 persons exposed to risk. If sickness is equally prevalent in this country, 12 million cases must occur on an average each year among 30 million wage and salary workers in the United States, at an estimated cost of $840,000,000. In 1933 one out of every 18 persons in the United States was a bed patient in a hospital. The average working life expectancy is 20 years.

The relative proportion of gainful workers to the total population of the United States, as reported in the 1930 census, is significant. The total population is 122,775,046, of which 48,829,920 over 10 years of age are gainfully employed. Of this number 22,000,000 are entitled to medical service under the compensation laws. From 1870 to 1930 the male workers increased 12%, while the female workers increased 84%.

During the period from 1920 to 1930 the population increased 16.1% but machine and mass production reduced the number of factory workers 1.8% in that time. In 1929, the year of the stock market collapse, 14,110,625 wage earners were distributed among manufacturing plants; and 75% of this number were in plants which had less than 1000 operators. It is the larger plants that employ industrial physicians. The average age of death for the industrially employed has advanced by several years, but is still some six to eight years lower than that for those in agricultural pursuits.

Dr. F. S. Crum estimates that, on a basis of 23,000 accidental deaths annually, and 115,000 accidents causing permanent and partial disability, 296,000,000 days of work are lost each year.

During the depression year 1932, out of the gross number of accidental deaths in the United States, which totalled 88,000, 15,000 were wage earners who were killed in industries. Industrial mortality among males in England and Wales in 1921-23, cited by R. H. Britten, of the United States Public Health Service, was as follows: Number of persons occupied or retired, 9,704,000, of which 876,400 were agriculturists.

Injury rates are highest in construction, mining and lumbering industries, while the tobacco, cement, and printing trades have the lowest. The injury rate in large plants employing 2,500 or more is less than half that of the smaller plants with under 100 employees. This is due to three factors: lack, in the smaller factory, of adequate medical service and safety measures, and a greater diversion of duties. Analyses by accident commissions have demonstrated that where industries have organized medical services there is less infection, about 50% less time lost because of injuries, and nearly a 30% reduction in compensation insurance costs.

Surveys have shown the average hospitalization of injured workers is 13.5 days, although it is 18% higher in plants of less than 250 workers. It is conservatively estimated that about three million injuries causing loss of time occur annually, and about 87,000,000 minor injuries. Costs for medical and hospital service total $72,000,000 annually, and compensation comes to $240,000,000.

C. O. Sappington has stated that there are 22 times more absences from illness than from accidents. In several surveys made in industrial towns it was observed that from 2% to 3% of the population were ill in bed from prevalent and chronic diseases. The principal causes are respiratory diseases (42%), digestive diseases (14%), and diseases from external causes (10%). In the United States the loss in earning capacity alone amounts to two billion dollars annually.

Accident Prevention

THE steel industry began in 1855 when Bessemer invented his process and the principle of the Bunsen burner was applied to furnaces. The great steel plants of the twentieth century were the outcome; as a result, occupational diseases such as heat stroke, cataract, poisonous gases and dust hazards became prevalent, and industrial accidents, such as trauma, burns and asphyxiation, were common. This was the impetus that developed the industrial physician.

The American Smelting & Refining Company estimated that the number of disabling accidents decreased by 76% in the period from 1913 to 1921. From 1906 to 1923 the United States Steel Corporation found a decrease of 55.39%, while 36,374 employees were saved from serious injury.

The first survey on Occupational Diseases, that of the Illinois Commission, was finished in 1910 under the direction of Dr. Alice Hamilton and under the guidance of Prof. Chas. R. Henderson, Dr. Ludwig Hektoen and others; and in June of the same year the First National Conference on Industrial Diseases met in Chicago at the call of the American Association for Labor Legislation, under the guidance of Dr. John B. Andrews, Prof. E. R. Commons, Prof. Henry W. Farnam, and Dr. Henry B. Favill. Following these activities came those of the U. S. Bureau of Labor Statistics, the U. S. Bureau of Mines, the New York State Factory Investigation Commission, 1914, under Dr. George Price, and others.

Wisconsin in 1919 found that out of 14,000 accidents 47% were due to either handling of objects or working machinery. Experience of the Ohio Industrial Commission shows that 50% of the fatal accidents occur among the foreign-born. Carl Hookstadt in the *Monthly Labor Review* in 1923 calculated the number of accidents as 2,474,650, and said that they cost the loss of 350,000,000 working days and a billion and a half dollars in wages.

At the National Safety Congress in 1924 it was shown that the greatest number of accidents causing loss of time occurred among immigrants from the Near East.

In the Bureau of Labor Statistics bulletin on "The Cause and Prevention of Accidents in the Iron and Steel Industries," it is stated that 81.4% of the accidents occur on the first day of employment, and 96% of all accidents happen within the first week. In another bulletin from the same source a statistical study shows that 60.9% of the injuries causing permanent disability are in the upper extremities, 12% in lower extremities, and 9.6% in the eyes, and the remainder in the other parts of the body.

After studying 220,707 accidents, the United States Steel Corporation, in its Bureau of Safety, Sanitation, and Welfare, Bulletin No. 8, stated that with the exception of the accidents in connection with overhead electric cranes, only 4.94% of these accidents were caused by machinery. Hand labor caused 44.4%. It was concluded that the majority could not be controlled by safety devices because they were caused by carelessness.

In an investigation of 300,000 accidents, the National Bureau of Casualty Underwriters ascertained that accidents most frequently occur at the "point of operation," and therefore their causes must be sought where motion is intense.

R. J. Young, of the Illinois Steel Company, has suggested the relative value of the different phases of accident prevention in a summary which provides an excellent basis for action. He suggests organization, 45%; safeguarding, 25%; and education, 30%. The National Safety Council, in Chicago, has issued more than 65 "safe practice" pamphlets covering almost every phase of engineering revision. It has developed a method for organizing a safety campaign for industrial plants, and a plan for inspection for the prevention of accidents.

Boyd Fisher has pointed out the mental causes of accidents, and says that the most prolific cause is ignorance. The purpose of safety education is to dispel ignorance by any available means.

The International Association of Industrial Accident Boards has determined a scale of time losses for deaths and permanent disabilities. For a known injury, this makes it possible to determine by scale the days lost and the disability percentage of the total; e.g., a death counts 6000 days lost and is a 100% disability, a thumb is 600 days lost with 10% disability.

Workingman's Compensation Laws

THE change from the doctrine of employer's liability to the principles of workingman's compensation regardless of fault is not an evolution but a revolution. The constant stress of social, economic, and labor problems in Europe gradually moulded public and philosophic opinion to a more concrete understanding of the principles of compulsory workingman's insurance. Previously the relation of the injured workman to his employer was a personal one which placed the employee, because of rules, at a decided disadvantage. There was first the negligence rule, which was so construed that an employee was considered negligent if he accepted a hazardous employment. Secondly, there was the fellow-servant rule, whereby the worker took upon himself the ordinary risks of the negligent acts of his fellow servants. Then there was the doctrine of assumption of risk, which was interpreted so that when an employee accepted a job, he assumed all the incidental risks. The employer resorted to the technicalities of twisting the common law, and various methods of securing releases from responsibilities by offering petty sums in return. To recover compensation from the employer, the employee who was hurt through personal negligence or an act of God causing injury met with the usual long legal processes which often he could not afford to follow through.

It is recorded that an edict issued in 643 A.D. by Rotari made it compulsory for employers engaged in the construction or repairing of houses to compensate injuries to masons resulting from occupational accidents. During the thirteenth century there were certain guilds of artisans who provided compensation for illness and injuries sustained by their members.

Switzerland in 1881 was the first country to declare that for accidents in certain employments the employer was to be liable without any proof of fault. The German Industrial Insurance Act of 1884, fostered by Bismarck, saddled the cost of compensation to its injured employees on the industry. This law was improved in 1900. Austria passed a compensation act in 1887, and Norway passed one seven years later. England adopted the new compensation principle in 1897 and greatly amplified its statutory principles in 1906. At present some 41 foreign countries have introduced workingman's compensation for industrial accidents. The United States was rather slow in adopting the compensation principles. Congress enacted a law in 1908 providing limited benefits to certain classes of Federal employees. The acts of 1882 (Life Saving) and of 1900 (Postal Service) had already provided some benefits.

The first American states to appoint commissions to study workingman's compensation were the commonwealths of New York, Wisconsin, and Minnesota, in 1909. The Wainwright Commission of New York showed that only one in eight injured employees received compensation, and then only 36.4% of the premium, the balance being expended on claim adjusters, legal advice, and commissions. It was these facts that stimulated New York in 1909 to be the first state to enact a law, although it was declared unconstitutional the following year. It was this law, however, patterned after the German and English laws, that was used by our various State legislatures to enact their present models. Washington, Kansas, Nevada, New Jersey, California, New Hampshire, and Wisconsin followed with compensation laws in 1911. The present New York law became effective in 1914.

North Carolina was the last state to enter, in 1929, as the forty-fourth state in the Union which

has effective workingman's compensation. Only four states remain without such laws: Arkansas, Florida, Mississippi, and South Carolina. In 1934, 18 states had state insurance funds, in conjunction with workingman's compensation, and 26 states are without these state insurance funds. Thirteen states have compensation laws covering occupational diseases.

The United States Act of 1927 provided for longshoremen and harbor workers. The act of 1928 covered civil employees of the government and private employees in the District of Columbia. The territories having compensation laws are Hawaii, Alaska, Porto Rico, and the Philippines.

The International Association of Industrial Accident Boards and Commissions was instituted in 1915.

Rehabilitation, including occupational diseases as well as injuries, has come to be a government function in several states, and some of our leading industrial surgeons, particularly H. H. Kessler, Newark, New Jersey, have had a leading part in this important matter.

Physical Exmination

AS A necessary program in the prevention of morbidity and mortality in industry, a medical service is essential, which includes a complete physical examination of all its employees. The cost may be mutual between employer and employee, or entirely defrayed by the former, who will be repaid by efficiency of the employee, less absenteeism due to illness and the resulting losses from idle machinery and labor turnover.

W. A. Sawyer, of the Eastman Kodak Company, in Rochester, New York, has stated that nothing in industrial medicine can pay such dividends to the employer as the physical examinations of employees. He introduced Roentgen chest examinations in the Eastman plants. In 1919 C. D. Selby, a member of the American Association of Industrial Physicians and Surgeons, prepared a standardized physical examination form for industrial plants which has proved so successful that it has been adopted by 64 major plants in the United States.

Harry E. Mock, of Chicago, pointed out in 1919 that in 10 large industrial establishments which he investigated the number of rejections as a result of physical examination of employees ranged from 3.4% to 5%. W. I. Clark, of the Norton Company, in 1921 discussed the false standards of what are called disabilities in industry. He showed that certain causes of rejection are unwarranted, depriving the Doctor of his best field for improving and placing these employees and maintaining the good will which the employer desires.

That by careful examination of their employees production has increased 28%, workers are kept more steadily at their tasks, and the morale of the working force has been strengthened, was shown in 1922 by E. L. Ryer and W. B. Fisher of the Whiting & Davis Company.

Advocates of periodical medical examinations for over a period of the last 50 years have been Dobell, of England, in 1860, Gould, of the United States, in 1900, Bares, of France, in 1902, and Fisk, of the Life Extension Institute, in the United States, in 1914.

The first life table for the population of England, in the period between 1838 and 1854, showed that the average length of life then was only 41 years. In the United States in 1921 it was 58 years, while for the year 1933 it was 60. H. Hart, of Bryn Mawr, in 1925 estimated statistically that if the present rate of expectancy continues, by the year 2000 the average duration of human life will be 100 years. Louis I. Dublin, of the Metropolitan Life Insurance Company, published in 1922 a statistical study of the results of physical examinations for a period of nine years, showing an average reduction in the death rate of the policyholders of 18%, and a reduction of 53% on impaired lives.

In the United States registrated area, the death rate for 1933 was 10.8, the lowest since 1900 when mortality statistics began to be officially compiled. M. L. Stecker in 1915 collected morbidity data in seven community surveys and said that in an industrial city such as Rochester, New York, 21.31% of the persons exposed were ill at the time of investigation.

Statistical estimates of the sickness prevailing in industry were made by B. S. Warren, of the United States Public Health Service, in 1916. He agreed that about nine days per year are lost by each employee. Louis Dublin, in an article entitled "Mortality Statistics of Insured Wage Earners and their Families," said that laborers form the largest single group and that the death rate is higher in the industrial population than in the rest of the country. The United States Public Health statistician, R. H. Britten, showed by the occupational mortality, as indicated in the life insurance records for the years 1915-1926, that the death rate per thousand among the professional and semi-professional classes is 3.27; among the skilled classes, 3.67; among the semi-skilled, 4.53; and among the unskilled, 4.77.

T. B. Sachs, of the Chicago Tuberculosis Institute, pioneered a plan in 1911 for the early detection of tuberculosis among workers in Chicago factories. In making physical examinations of 7,000 employees during a period of four years, H. E. Mock, of Sears Roebuck & Company, found in 1914 that 4% had tuberculosis. Louis Dublin published a work on the causes of death by occupation in 1930. He concluded that the exposure to industrial hazards is cumulative in its deleterious effect. Compared with workers in non-hazardous employments, wage earners are at a disadvantage with respect to every important cause of death. The tuberculosis rate is especially high in the industrial group, from two and one-half to four times that of the non-industrial population. Deaths from pneumonia and accidents are over twice as frequent, and degenerative diseases are from two to three times as great.

The economic loss from sickness and accidents is great. Irving Fisher, of New Haven, estimated in 1909 that three million persons are seriously ill in the United States at all times, and that 42% of this is preventable. The Metropolitan Life Insurance Company of New York showed that the average loss from sickness among the insured group was 5.8 days per year for males, and 6.9 days for females.

The United States Commission of Industrial Relations found in 1913-1915 an average loss of nine days a year from sickness among 30 million American wage earners. E. Sydenstricker, of the

United States Public Health Service, in 1925 determined as to the incidence of disease and illness in a general population group, that over 100 cases of illness occur annually for each death that takes place.

D. K. Brundage, of the United States Public Health Service, statistically studied the frequency of disability lasting longer than one week and its causes among industrial employees. He made his investigations from 1920 to 1927.

H. Cheney, of Cheney Brothers, in South Manchester, Connecticut, estimated his losses due to sickness in industry in the form of hiring new men, idle machines, reduced production, spoilage, etc., at approximately $60.00 per person.

C. O. Sappington, of Chicago, in 1924, in a thesis covering five years' experience with sickness and accidents, has shown in a study at the Edison Electric Illuminating Company, of Boston, Massachusetts, that sickness causes 20 times more absenteeism than accidents, and is responsible for seven times as much loss of time from work.

Regarding the expense to the industry for medical service, much can be said. Endicott Johnson Company, of Binghampton, New York, whose industrial medical service is probably the best in America, averages a cost of $25.00 per employee each year in giving full medical service to employees and their families; with 80% of this for professional services. E. H. Huyck, of Huyck & Son, in Albany, estimates after 11 years' experience that their liberal medical service plan costs 3.16% of the wages paid to the workers. W. Irving Clark, of the Norton Company, in 1922 estimated that an average expenditure of $6.00 per employee each year is adequate for ordinary industrial medical service.

Poisonous Gases and Vapors

Some Methods for Their Determination and Estimation—Book Review

By C. O. Sappington, M.D., Dr.P.H.

HERE is a practical manual for the industrial hygienist, and it is of especial importance because, as the translator says: "The detection and estimation of substances in air for industrial health purposes is relatively a new field of applied chemistry."

The methods detailer are those which have been developed very largely through the Union of Soviet Socialist Republics, in which industrial hygiene chemistry has received what might be called wide theoretical and practical development.

Consideration is first given to the general methods and apparatus available for air sampling and analysis and further to the determination of substances in the air of industrial establishments, referring especially to inorganic types. Then follow the specific methods for carbon dioxide, carbon monoxide, sulphur dioxide, hydrogen sulphide, carbon bisulphide, nitric acid and the oxides of nitrogen, ammonia, chlorine, hydrogen fluoride, hydrogen chloride, hydrogen cyanide, arsenic and arsene, metals in general, zinc, mercury, lead, organic materials, methane, acetylene, formaldehyde, acrolein, acetone, alcohols, phenols, esters, ethyl ether, benzine, benzol, toluol and xylol, aniline, nitrobenzene, and turpentine. There is also an appendix with valuable material on technical gas analysis, the Orsat apparatus, standard solutions and such subjects as acidimetry and iodomentry. Excellent tables are also included, referring especially to the toxicity of gases and vapors and the physical properties of these substances. A selectde bibliography is included and is divided into various headings, referring to different compounds.

The manual was originally written by A. S. Zhitkova, Supervisor, Moscow Chemical Laboratory, U.S.S.R.; it contains an introduction by Prof. S. I. Kaplun, Supervisor, Central Executive Institute for Work Sanitation. This American translation was done under the direction of Joseph B. Ficklen, Chemical Engineer, Travelers Insurance Company, Hartford, Connecticut.

The volume contains 198 pages, was published in 1936 by Service to Industry, Box 133, West Hartford, Connecticut, and is priced at $3.00.

Industrial Dust

Book Review

By C. O. Sappington, M.D., Dr. P.H.

THIS volume of 316 pages on the subject of "Industrial Dust (Hygienic Significance, Measurement and Control)" written by Prof. Philip Drinker and Theodore Hatch will probably become one of the most valuable reference books on this subject in the English language.

The authors' preface states the purposes of the book better than the reviewer possibly could: "Control of the dust hazard in industry is the joint duty of the physician and engineer. In the preparation of this book we have emphasized the cooperative nature of the problem and have devoted considerable space to such of the medical aspects as may help the engineer to understand the manner in which hygienic requirements affect engineering design and operation of dust-control equipment.

"So far as possible, only the basic principles are considered. The book is written from the engineer's standpoint but we hope that it will be of some value to the physicians who wish to understand more fully the engineering aspects of the problem. Design of dust control apparatus is an engineering matter but it is often the physician who finally appraises the success of the control system."

"Unfortunately, current practice in the field of industrial hygiene permits the indiscriminate mixing of British and metric units. Thus, fans are rated in cubic feet a minute but dust particles are measured in microns. We do not support these inconsistencies but have merely followed the usual nomenclature and practice in this book."

An idea of the scope of the book may be gained by considering the chapter titles—Physical Properties of Dusts, Fumes and Mists—Effects of Dusts and Fumes upon Man—Physical and Chemical Factors in Pneumoconiosis—Permissible Dustiness—The Dust Survey—Dust Determination—Determination of Particle Size—Chemical and Mineralogical Analyses—General Control of the Dust Hazard—Design of Local Exhaust Systems—Air-Cleaning Apparatus—Air-Cleaning Apparatus (filtration) and Dust Respirators and Air Masks.

There may be some slight differences of opinion

in regard to some of the statements made in this work, but in general the principles set forth are well agreed upon by authorities.

The fact that the impinger method of dust measurement possesses the important advantage of having been used in all valuable dust studies conducted by the U. S. Public Health Service and also the subsequent development of dust standards in terms of this instrument based on such studies is emphasized by the authors. Equal emphasis, however, is placed upon the difficulties encountered in using this instrument in surveys, with the illustration given that when three men were in attendance it was possible to collect only four samples in one day. This instance must have been one of the extremes encountered in dust survey work.

No review of this book would be complete without a few words concerning the excellent treatment of the principles of design of local exhaust systems, so ably worked out by Mr. Hatch. To any engineer, this part of the book alone is well worth the price and all the study and time that it may be given.

To the physician, there is basic and fundamental information in the book which it is impossible to get elsewhere.

The volume is replete with diagrams, photographs and tabulations, which are all selected with great discrimination and convey the impressions given in the text more graphically than otherwise would be possible.

A comprehensive bibliography is included, containing 260 references.

This book should secure wide circulation and should be useful to any physician, engineer, industrial hygienist, industrialist, or any other persons interested in any phase of any dust problem. It is published by The McGraw-Hill Book Company, 330 West 42nd Street, New York City, and the price is $4.00 (1936).

The Dennison Hospital Benefit Association

By HALSTEAD G. MURRAY, M.D.,
Framingham, Massachusetts

THE Men's Mutual Relief Association of the Dennison Manufacturing Company has been in existence for over 25 years. The Association is directed and controlled by the employees, and since 1932 it has borne all expenses for collection and clerical work which previous to that time had been absorbed by the company. Briefly, the Association pays any sick, injured, or disabled member $12.00 per week for a period of 10 weeks, in any one year, at a cost of $.50 per month, per member. There is a waiting period of one week before benefits begin, and there is a death benefit of $100.00. At the present time there is a balance in the treasury of over $12,000.

In 1922 it was suggested to the supervisors of the Men's Mutual Relief Association that the Association could probably offer its members a hospital insurance plan for a small yearly fee. A Committee was appointed to look into the feasibility of such a plan, and their report was that it seemed very likely that the Men's Mutual Relief Association could give its members some plan for hospital care when needed, for a fee of $2.00 per year per member.

The first year 553 members from a membership of about 900 signed up for benefits under the Hospital Insurance Plan at a cost of $2.00 per member. At the end of the first year of its operation there was a balance in the treasury of $650.00 and only 10 members had required hospital care, at an average of $45.60 per case. The Hospital Benefit Association has continued since that time, and has had an average membership of 583.

The average number of men requiring hospital care per year has been 16. The average cost per hospital case for the entire period (1921 to January 1, 1936) has been $28.00 for seven days. The average cost of the Hospital Benefit Association for each member has been $0.678 per year.

At the present time any member of the Hospital Benefit Association who is sick or injured and in the opinion of his physician is in need of hospital care, is entitled to four weeks' care, in any hospital, at a rate not exceeding $4.00 per day. In the beginning the rate was not to exceed $3.00 per day and the period of hospitalization was for three weeks.

All new employees of the Dennison Manufacturing Company are required to have a physical examination before employment, and all new members of the Men's Mutual Relief Association have a physical examination. This examination does not bar any employee from membership in the Relief Association and practically all applicants are accepted for membership in the Hospital Benefit Association. No employee who has been a member of the Hospital Plan is barred from continuous membership as long as he is a member of the Relief Association, even though his general condition was such as to make him a bad risk so far as hospitalization is concerned.

This plan for group Hospital Insurance is interesting because it gives hospital care to a sizeable industrial group at a low annual cost per member. It has operated successfully over a period of 15 years and has had a yearly surplus at a cost of only $2.00 per year per member.

It gives its members a strong sense of security against economic loss due to prolonged hospitalization and it is one more workable plan of hospital insurance, which is a live subject at the present time.

The following are the By-Laws of this Hospital Benefit Association:

"This association shall be known as the HOSPITAL BENEFIT INSURANCE ASSOSIATION OF THE DENNISON MANUFACTURING COMPANY.

"The purpose of this Association is to provide for hospital care for members of the Men's Mutual Relief Association of the Dennison Manufacturing Company who may desire to avail themselves of the privilege.

"The officers and supervisors of the Men's Mutual Relief Association shall have full charge of the Hospital Benefit Insurance Association.

"They shall have the power to alter or amend the rules and regulations.

"All changes or amendments to the rules and regulations must be approved by two-thirds of the officers and supervisors before becoming effective.

"The Sick Committee of the Men's Mutual Relief Association of the Dennison Manufacturing Company will be responsible for the carrying out of the plan as outlined in these Rules and Regulations.

"MEMBERSHIP: Group 'A'. Any member of the Men's Mutual Relief Association who is rated 'A' or 'B' on his application for membership, and in GOOD HEALTH, is eligible for membership in the Hospital Benefit Insurance Association *without* restriction. No physical examination will be necessary. (Any member of the Men's Mutual Relief Association as of February 1, 1929, shall be considered as being in Group 'A.')

"GROUP 'B.' Any member of the Men's Mutual Relief Association who is rated as 'C' on his application for membership, is eligible for membership in the Hospital Benefit Insurance Association *with* restrictions. A physical examination is required before the admission of a member rated as 'C.'

"The Board of Supervisors will determine from the result of the examination the restrictions under which he will be allowed to join the Hospital Benefit Insurance Association.

"All 'C' applicants shall be notified by the Secretary of their restrictions to hospital benefits, and if they accept them they shall sign an agreement to these restrictions in duplicate—the original to be kept on file by the Secretary of the Men's Mutual Relief Association and the copy to be given to the applicant.

"Membership in this association is on the basis of a yearly contract that begins December 1 and ends November 30 of the following year.

"All applications for membership must be made before November 1 and are subject to the approval of the Board of Supervisors of the Men's Mutual Relief Association. No applications will be received after that date except from new members of the Men's Mutual Relief Association.

"New Members will be eligible for membership in the Hospital Benefit Insurance Association within the period of 30 days after joining the Men's Mutual Relief Association. Thereafter, they will be subject to the same rules as old members of the Men's Mutual Relief Association.

"Any member of the Hospital Benefit Insurance Association who drops his membership in the Men's Mutual Relief Association, will continue as a member of the Hospital Benefit Insurance Association for the balance of that hospital year, providing he remains in the employ of the Dennison Manufacturing Company.

"DUES: The dues shall be $2.00 per year payable in advance. (Hospital year commences December 1 and ends November 30.)

"Any member joining the Hospital Benefit Insurance Association November 1 and who ceases to be an employee of the Dennison Manufacturing Company before December 1 of the same year, will have his $2.00 refunded.

"Any member who ceases to be an employee of the Dennison Manufacturing Company before January 1 of the following year, and who has not received any hospital benefits on the new contract, will be entitled to a rebate of $1.00; but after January 1 neither the $2.00 nor any part thereof, will be refunded for any reason.

"BENEFITS: Any member of the Hospital Benefit Insurance Association who is sick and in the opinion of his physician is in need of 'Hospital Care,' will be entitled under the provisions of this plan to hospital care in any hospital for a period not exceeding 28 days during the year beginning December 1, and ending November 30, of the following year, and at a rate not over $4.00 per day.

"The term 'Hospital Care' includes room, bed, food and such medicine as are ordinarily furnished patients. Should a hospital charge more than $4.00 per day for 'Hospital Care' the member shall personally pay whatever amount is charged over and above the $4.00 per day. Should a hospital charge less than $4.00 per day for 'Hospital Care,' and in the event that a member is charged on his hospital bill for items other than 'Hospital Care,' this Association will, in such case, pay directly to the Hospital the difference between the actual amount charged for 'Hospital Care' and the $4.00 per day maximum allowed; but no member will be entitled to receive any money from the Hospital Benefit Insurance Association for himself if the charge for 'Hospital Care' is less than $4.00 per day, and provided there is no charge for other items on his hospital bill.

"The Hospital Benefit Insurance Association will not be responsible for 'hospital care' which is paid for under the provisions of the workmen's compensation act, government free hospitalization service to veterans or by an insurance company. No benefits shall be paid to any person after he ceases to be an employee of the Dennison Manufacturing Company.

"A new member of the Men's Mutual Relief Association admitted to membership in the Hospital Benefit Insurance Association after November 1, will be entitled to benefits in the Hospital Benefit Insurance Association after 30 days from the date of his application for Hospital Benefit Insurance and until the end of our Hospital year (November 30).

"All costs due any hospital under this plan will be paid directly to the hospital authorities, unless the person has been obliged to pay the hospital bill himself, in which case the Hospital Benefit Insurance Association will reimburse him for that part of his bill for which it is liable under its hospital rules, whenever the receipted itemized bill is presented to his supervisor, or to the Secretary of the Men's Mutual Relief Association.

"If, at any time, the funds of the Hospital Benefit Insurance Association are insufficient to provide the benefits to which a member is entitled, it shall be the duty of the Board of Supervisors of the Men's Mutual Relief Association to make arrangements to care for any cases that may arise.

"Ten per cent of the receipts from the Hospital Insurance dues will be set aside each year as a Special Hospital Fund. This Special Hospital Fund is to be used for such hospital cases as in the judgment of the Supervisors of the Men's Mutual Relief Association it may deem necessary."

Congress of Railway Surgeons

THE 47th Annual Congress of Railway Surgeons, held at the Palmer House in Chicago, November 5-7, 1936, was generally conceded to be the most successful in more than 10 years.

The election of officers of the American Association of Railway Surgeons saw DR. W. A. MCMILLAN, of Charleston, W. Va., elected to the Presidency; DR. V. H. HORNING, Chief Surgeon, Chicago & North Western, elected a Vice-President, and DR. HARVEY BARTLE, Chief Surgeon, Pennsylvania Railroad, and DR. JOHN G. FROST, Chief Surgeon, Chicago & Eastern Illinois, added to the Executive Board.

Industrial Medicine

The Journal of Traumatic Surgery and Occupational Diseases

Published Monthly

Publication Offices

413 Pleasant Street, Beloit, Wis.

Editorial Offices

844 Rush Street, Chicago, Ill.

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ASSISTANT EDITOR:
FRANK C. LEWIS, M.D.

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VOLUME 5 DECEMBER, 1936 NUMBER 12

Industrial Medical Practice

SOCIAL economics along broad lines, and industrial economics along specific lines, have modernized to a very considerable extent the traditional concept of the duties of the employer to the employee. The indefinite generalities of the older common law are being slowly but effectively supplanted by the definite and specific obligations of the newer statutes. In the process a number of extra-contractual relations between employer and employee are being permanently superimposed upon the basic relation of the contract of employment. All of these have their origin in, and owe their existence to, the *fact* of the employment; and in all of them the employer —in one way or another, but always to an extent involving costs in addition to wages—is the party of the paying part.

The most important of these superimposed relations is that one which has been made specific by workmen's compensation legislation.

This has been persuasive toward a study of medical services in industry, with the result of a considerable movement on the part of industry and the medical profession toward the organization and establishment of medical services for employees on a *medical* basis.

The next important superimposition, and the one of the greatest present interest, is the addition of occupational diseases to the matters of statutory significance—which brings to the necessity of instant attention the study of, and the need for, preventive medical measures.

Industrial medicine, with its concomitants of industrial and traumatic surgery, is the field of medical practice which is developing around, and has already attained important and definite proportions in connection with, these and their attendant superimpositions.

The ultimate boundaries of the field of industrial medicine as it interests the medical profession are, therefore, the boundaries of all employment wherever and in whatever form it exists.

And the ultimate scope of the work which is to be done—and which *can* be done—only by the medical profession, is thus measured by the *medical* needs of the individual human being in three relations:

Medical science must be brought to bear:

1—Not only upon the employee as an individual human being,

2—but also upon him as one of the parties, and inevitably the *human* party, to a contract of employment,

3—and likewise upon the situation in which he, as a human being, performs his contractual duty.

These three relations involve the medical, insurance, medicolegal, occupational disease, accident prevention, hygiene and health, and physical condition factors, considered in their social, economic, administrative and managerial phases, as well as, and in addition to, their scientific phases—and, to a lesser but growing extent, certain psychological, emotional and physical idiosyncrasies.

And all of these added phases, to the full extent of their superimposition resulting from the *fact* of employment, enlist medical thought and demand medical attention not primarily because they concern the human being, but essentially because they concern the human being *in employment*—against the background of the statutory responsibility of the employer in terms of an expense which ultimately he must pay if they do not receive medical attention.

A broad field, and a broad scope—both so vast that industrial medicine cannot be a specialty in medicine or surgery, but on the contrary must consist of the application of all medical and surgical specialties to the economic situations as well as to the personal situations of the human beings who are the performing parties under their respective individual contracts of employment.

Industrial medicine, therefore, is something added to the practice of medicine—just as the need for it and the recognition of the need are added to working conditions.

If it should require a definition, it may be said that industrial medicine is the doctor-patient relation *plus*, because while it includes all of medical science which concerns the individual as a human being it also takes cognizance, in terms of medical science, of the fact that this individual is subject to the influence of his work and the environment in which that work is performed.

The *plus* is the effect of the employment; it adds every kind of need for medical science that has its genesis in the employment; and thus it is a general overlay of medical science as a whole upon employment as a whole.

And so, *industrial* medical practice isn't a special kind of practice. Instead it is *a special field for all kinds of practice.*

Industrial Medicine and Surgery

Some Essentials in Occupational Disease Legislation

THE subject of occupational diseases is most appropriate for a meeting such as this. * It is the most fertile field for legislation and court interpretation at the present time in the whole range of workmen's compensation and employers' liability. Moreover, it is a subject as to which there has been a vast deal of loose thinking and emotional reaction. Having been a proponent and one of the administrators of the first real occupational disease law in this country, namely, that of New York, enacted in 1920, I have had a fairly wide opportunity to observe the law and to evaluate some of the factors in it.

More recently I have had the opportunity to work with the Advisory Committee of the Association of Casualty and Surety Executives that has been studying the occupational disease situation, and have thus been able to study the data available to that Committee with regard to the experience of other states and foreign countries.

First let me say that the Association of Casualty and Surety Executives, representing as it does the stock casualty company interests, recognizes and assents to the principle that the death or disability of a workman from a disease which is clearly and unmistakably the result of an industrial process in which he was employed, and not the result of a health hazard of the general population, should be deemed to be and treated as the happening of an injury by accident, subject, of course, to special rules and procedure applicable thereto, due to its different nature. It follows as a logical consequence that such diseases should be brought within the purview of compensation laws, where the employer and worker interests in any state accept the principle. The acceptance of such principle, of course, means the assumption of a certain, definite, though limited, liability on the part of the employers, and the renunciation by labor, in return therefor, of any right against the employer based upon negligence or fault, at common law or under any statute.

In recognition of this principle, our Advisory Committee has given intensive study to the provisions that, in its opinion, should be embodied in any statute providing compensation for occupational diseases. These provisions have been embodied in so-called model provisions that are available for adaptation to the conditions presented in any state.

These so-called model provisions or suggestions were approved by the Advisory Committee more than two years ago. They have very recently been revised and now embody a number of departures from the earlier draft as the result of much recent experience, study and discussion.

It is impossible and, in fact, would not be profitable to attempt here to present all of the points covered in that plan. There are, however, certain essentials that should be kept in mind in the drafting and consideration of legislation; and it is of some of those essentials that I would speak.

Plans of Coverage

CHARACTERISTIC of the loose thinking that too often characterizes consideration of this subject is the contention frequently made that the law should provide compensation for "any and all occupational diseases", in just that language and without further specification. Thus we may have injected into the law a term—"occupational disease"—that is not defined and the exact definition of which is quite baffling. The same result is sometimes attempted by the simple expedient of striking out the words "by accident", whether they are used to modify the term "injury". This is on the theory that compensation for "injury" should include injury by accident or by disease, as distinguished from the earlier and more limited term "injury by accident", and without distinction.

It seems hardly necessary to remind you, members of the Bar, learned in its tenets and principles, that the way of justice would not be served by placing on an employer obligations and duties in language so vague that neither he, nor the beneficiaries under the law, nor, in fact, the administrative authorities and the courts, would know or could learn what the obligation is. Surely, in fairness to all, there should be some standards set, some limits to the meaning of the law. Else, under the guise of legislation for occupational diseases, we might find that we have provided general health and life insurance for workers at the expense of the employer. And it is a fair question for us to consider whether we wish to do that and whether industry, already staggering under well nigh intolerable burdens, could assume the incalculable additional burden of such an obligation. At any rate, such a program should only be undertaken with wide opened eyes and with full realization of the liabilities implicit in it.

Not infrequently I have heard the suggestion made, in connection with the indefinite coverage provision, that we might well let the courts define what is an occupational disease. May I, with due respect, suggest that that is not the function of the courts. Theirs is not the duty of exercising legislative judgment or of making the definitions that the legislature is unable or unwilling to make. The function of the courts is interpretation—not legislation.

As opposed to the vague indefinite plan of general coverage, I believe the fairer, more certain, and more scientific plan of occupational disease coverage is the so-called schedule plan, or listing in the law of the diseases that are deemed to be occupational. To such a schedule may be appended a listing of the progress or conditions under which such diseases occur industrially. This latter I do not regard as wholly essential, though desirable from many viewpoints.

A list of the diseases covered and the processes in which they occur has the advantages of certainty and the avoidance of much expensive and disappointing litigation and it makes for efficiency of administration. Without such definiteness there is grave likelihood that in cases which excite sympathy, where death or lingering illness follows upon the contraction of some disease of ordinary life—such for instance as pneumonia, common colds followed, perhaps, by tuberculosis, heart disease alleged as the result of long continued heavy work, the ordinary diseases of a contagious nature which may be epidemic in the community, and many others, —the employer may be held liable to compensate for such conditions, and his insurance carrier required to assume such unknown and unknowable liabilities. I should fear that such a perversion of the compensation principle, such an extension of the law to conditions never contemplated, would result in an eventual breakdown of the system or its conversion into a purely paternalistic governmental relief system based on social need rather than on any rule of legal liability.

The point I would emphasize is that no system of employers' liability can securely be based upon language so all-inclusive and vague that it may mean anything at all or practically nothing, depending on the administrative policy. It would impose an improper discretion upon the law administrators and not sufficiently apprise the employer of his duties and obligations. The burden of cost of such could not be adequately estimated, for there is no realized experience to indicate what might occur, and once the lid should be lifted, it might become a veritable Pandora's box, and never be brought under control or confined within proper limits.

For those who fear that the schedule plan may not be found to be inclusive of new diseases and poisonings resulting from the development of new processes in industry, let me say that it is perfectly simple and acceptable for the legislature to confide the power, subject to definite conditions, to enlarge the list of diseases covered to the Industrial Accident Board or, perhaps more appropriately, to the public health authorities.

Recognizing that the local conditions may make it impracticable in some states to adopt the schedule plan, it may be unavoidable to resort to an attempt to define in general language what is meant by the term "occupational disease". We have given much thought to a satisfactory definition, but without entire success. It is easy to define "disease" and to define "occupational". But conjoined they have vague implications and possibilities of endless extension and uncertainties. For those who must employ such a definition, I would recom-

* HENRY D. SAYER, Former Industrial Commissioner, State of New York, Consultant, Association of Casualty and Surety Executives; Address before the Insurance Law Section of the American Bar Association, August 25, 1936.

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3. Gardner & Gardner —Am. J. Dis. Child. 47:1261 (1934).
4. Cameron — J. Am. Dietet. A. 11:189 (1935).

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mend the following: "An occupational disease is one arising from conditions that are characteristic of and peculiar to a particular trade process, occupation or employment, in which the employee was employed."

This definition, I believe, will best stand scrutiny. If fairly applied, it will not include the diseases of ordinary life that are only incidentally or speculatively related to some condition of the employment, and it will include all those diseases that are truly occupational.

While the recent New York amendment contains no definition, the Industrial Board has ruled for the instruction of the referees that the term occupational disease means a disease characteristic of and peculiar to the occupation. And the very recent Rhode Island law on the subject contains the definition in the exact language quoted above.

Accrued Liabilities

PASSING quickly over some of the essentials, we must recognize that disease, unlike the sudden accident which is fixed as to time of its occurrence and, generally speaking, located as to the employment in which it happens, is often an affair of long development, and indefinite as to the employer against whom it should be charged.

To a degree this is true as to many occupational diseases such as the metallic poisonings,—lead, arsenic and the like,—but as to the dust diseases of the lungs, which require years of exposure to develop and which do not manifest themselves until after from five to 25 years of exposure, it is so deeply inherent that special rules of procedure and of liability suggest themselves.

Silicosis, for example, or any other pneumoconiosis, creates problems unique in compensation practice. It gives rise to the problem of the so-called "accrued liabilities". This term, which has come into common use in connection with this problem, is really a misnomer, since the condition so denominated is neither "accrued", nor is it a present "liability". By it is really meant the accrual of a physiological condition of the lungs, which is permanent but not necessarily presently disabling. We speak of it as "accrued" because there already exists a condition which may progress until actual disability or death ensues. It is regarded as a "liability" because, if and when it becomes actually disabling, the employer will have to pay for it.

The accrued liabilities are what have made and are making compensation for silicosis so burdensome for the employer and such a spectre for the insurer. The present assumption of responsibility for a condition brought on by years of exposure—perhaps almost entirely with another employer or employers—is a liability that few can afford. It is thoroughly retroactive in this aspect.

Within the past year, two notable methods of approach to the problem have been tried, the so-called waiver provision of Illinois, and the transitory limited benefit in New York.

Waivers

IN THOSE industries in which there is a definite dust hazard and where the more skilled workers, who command the highest wages because of their skill, have been exposed for years to dust hazards, it has become a matter of public concern to permit such workers to retain their jobs and to permit industry to retain and utilize their skill. None the less, many of these workers would be found, on physical and x-ray examination, to have undoubted evidence of non-disabling silicosis. When disability may occur, no one can tell. Many of these workers may continue in their regular employment through a normal span of working life, without disability. On the other hand, such a person is a potential hazard, likely to become disabled at any time. Nor can he be cured or his condition particularly alleviated by a discontinuance of his work, or engaging in a non-dusty occupation. He sees no justice in his being deprived of a livelihood at his chosen occupation. He has perhaps learned a trade and finds he is too old now to learn a new one.

In such a situation, partial relief to both sides is effected through the so-called "waiver plan". An illustration of this is to be found in the Illinois Law recently enacted (effective on October 1). Under that law, an employee who has non-disabling silicosis, may apply to the Industrial Commission for permission to waive in part his compensation rights. Such application must be accompanied by medical evidence that he has non-disabling silicosis. Upon approval by the Industrial Commission, this employee will be permitted to continue in his employment and, in the event of subsequent disablement from silicosis, he will be entitled to compensation limited to 50% of what he would have been entitled to had he not waived and been continued in his employment. It is estimated that, with such a waiver of full compensation, the employer will be enabled to obtain insurance at fairly reasonable cost and the employee can be continued at useful and remunerative work. Without such a provision, of course, the only alternative left to the employer in many cases would be the elimination of such employees prior to the assumption of any liability by them under the new act. How well this provision will work remains to be determined by the test of experience.

The Transition Period

ANOTHER approach to the problem of accrued liabilities is that recently adopted in New York. Because of the uncertainties and unlimited liability for conditions among workers in dusty trades, which had been accumulating for many years, the situation in New York following the enactment of the all-inclusive law effective last September, became chaotic and many plants were forced either to shut down entirely or to curtail their operations, throwing many employees out of work. Employers could not afford to take the chance of continuing in their employ old workers who had been for many years exposed to silica dust. This condition was unsatisfactory equally to the workers and to employers. An agreement was finally arrived at between the workers, the employers and the administrative authorities, whereby for a transition period, so to speak, following the inception of the law and until a sufficient time shall have elapsed to constitute an injurious exposure under the new law and dispose of the accrued liabilities, to provide for a very limited maximum compensation benefit, which benefit, in theory, is proportional to the period of injurious exposure under the law. This benefit increases as the period of injurious exposure increases. Hence it was provided that in any case of disability or death occuring during the month following the enactment of the new law, the total compensation benefits shall be limited to $500. This maximum limit is then increased by the amount of $50 each month thereafter. Thus, in the case of a person disabled or dying one year after the effective date of the new law, the maximum compensation shall be $1,100, or if the disability occurs two years after the new law, the maximum benefit shall be $1,700. This graduated compensation benefit increases until a maximum of $3,000 is attained and thereafter for any claim for disability and death from silicosis $3,000 is the limit of the employer's liability. In this manner the cost of compensation insurance is reduced to an extent that permits industry to employ workers in dusty trades.

An essential part of any such program of compensation benefits is prevention. All parties in industry are agreed that the elimination or control of dust and the prevention of disabling silicosis is more essential than compensating for the disease after it has become disabling, and in enacting the provision last outlined the Legislature gave to the Industrial Commissioner and the Industrial Board in New York very wide powers for making rules and regulations for the control of harmful dust in industry and made liberal appropriations for experimental work in those lines.

I should like to emphasize the importance of work along prevention lines. This cannot all be done by legislation. It requires the intelligent cooperation of employers and labor, administrative authorities and public health officers. The real key to the silicosis problem is in prevention and dust control.

Medical Benefits

AS A PART of any program for limited compensation or waivers for silicosis, special consideration should be given to the subject of medical treatment. Some states at present have provisions for unlimited medical benefits in cases of injury by accident; many of them, however, now limit medical treatment in terms of weeks allowable or of total cost. Unlimited medical benefits are only justifiable where medical treatment will be of avail. The weight of expert medical opinion, however, is that in simple uncomplicated silicosis or asbestosis, medical treatment avails nothing. The disease is said to be incurable. The fibrosis of the lungs is permanent and no effective palliative or remedy has been developed. The case of the silicotic, however, presents an exceptionally fertile field for medical exploitation. Some effective and reasonable limitation, therefore, should be placed upon medical benefits to protect industry

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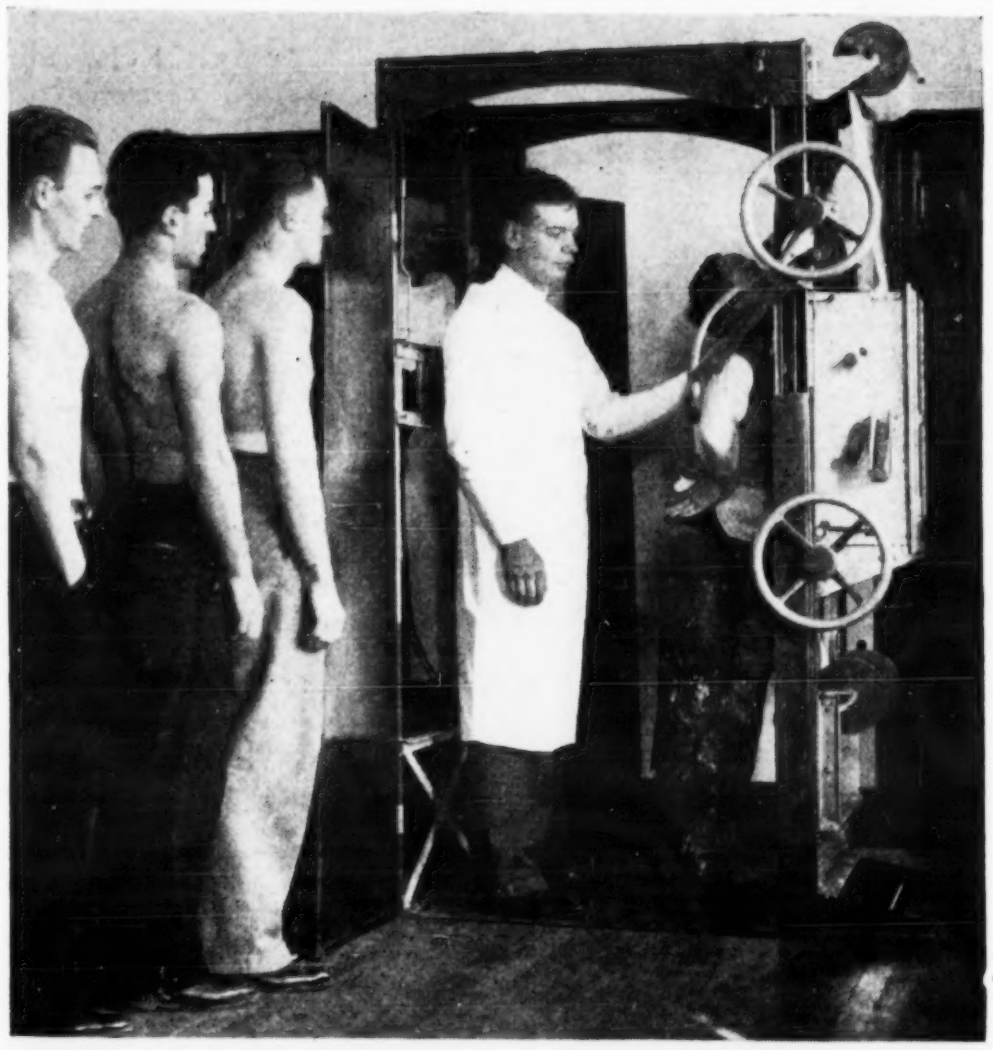

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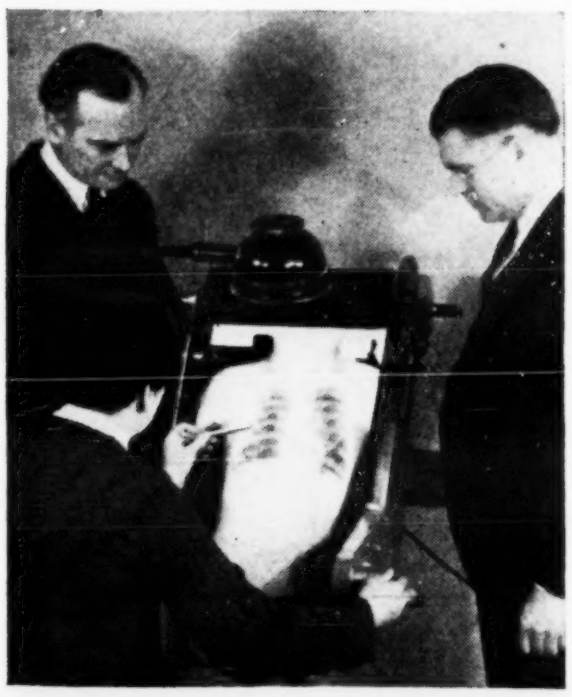

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against exploitation or against expensive notions that the disabled worker or his physician may indulge in. A limitation of three months' medical treatment with a discretionary extension of three months when and if treatment is useful, seems logical.

Special Medical Boards

SO MANY and so complex are the medical problems incident to the administration of an occupational disease law, and particularly those relating to dust diseases of the lungs, that the ultimate determination of medical questions should not be left entirely to non-medical administrative officials. The sure diagnosis of silicosis, its cause and its differentiation from some other non-industrial conditions, presents many points of difficulty. It has been said in England that the only certain diagnosis of silicosis is one made after death. We cannot wait until after death to make such determinations. They must be made during life. Many simple and uncomplicated cases of silicosis may be presented where the diagnosis is comparatively easy and fairly certain. Many other cases, however, will present the extremes of difficulty. It is suggested, therefore, that there should be set up under any occupational disease law a special medical board to be composed of physicians of recognized standing and attainments in the field of diagnosis of occupational diseases. Such a board need have no functions with regard to the determination and finding of non-medical facts, but after such facts have been established, such as the question of length of employment, degree of exposure, including both concentration and content of dust, the presence or use of poisonous material, and other facts in the occupational history of the individual, then, if there be any medical controversy, the case should be referred to such medical board which shall have authority to make independent examinations, and it shall render its opinion on the condition that exists, the extent of disability, the date of disablement and the relationship between the employment and the condition found. Findings of such a medical board should be final and conclusive on the medical questions or, if subject to review, they should be disturbed only by the manifest weight of evidence.

Other Essentials

OTHER essential points that should be considered include the following:

Effective means must be provided for full and truthful occupational histories wherever required by the employer. The most effective means, it seems to me, is to provide that no compensation shall be payable where there has been a false representation in writing as to previous disability from or exposure to the hazards of an occupational disease.

The matter of time limitation should be given careful study. The usual provisions for time limitations as to notice, filing of claim, etc., in compensation laws for accidental injury, are not always applicable in laws for occupational diseases. Notice of an occupational disease is somewhat more essential than is the case with accidents, most of which are known or witnessed, and it should be more definite in its provisions. Possibly a longer time in which to give notice should be provided for than in the case of accident. It is important also that a fair limitation be set on the time between the last injurious exposure and the development of a disease for that disease to be deemed a consequence of the occupation.

Privision should also be made for those cases in which a pre-existing non-occupational disease may be aggravated or contributed to by an occupational disease. Manifestly, where a non-occupational disease is the chief cause of disability or death and some occupational disease is a minor contributing factor thereto, it would be unfair to charge industry with the responsibility for the entire disability or death. Compensation therefor should be allowed only for the proportion of the disability caused by the occupation. The determination of this question becomes a medical one which should be determined by a medical board.

I have not attempted here to set forth in detail all the points that are important to be observed in connection with occupational disease legislation and administration. I have not attempted to go into the vitally important matters of cost to industry or to the workers nor of developing plans for the further study of occupational diseases by industrial hygiene divisions in state health departments or in labor departments, nor have I attempted to dwell on the engineering features involved in the problems of prevention. I trust that I have in-

THE BULLETIN

of

The American Association of Industrial Physicians and Surgeons

THE object of this Association shall be to foster the study and discussion of the problems peculiar to the practice of industrial medicine and surgery; to develop methods adapted to the conservation of health among workers in the industries; to promote a more general understanding of the purposes and results of the medical care of employees, and to unite into one organization members of the medical profession specializing in industrial medicine and surgery for the mutual advancement in the practice of their profession.

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dicated, however, that serious and vital questions are involved in this whole program. The program is in the process of progressive development. I trust that the American Bar Association will play an important role in the development of that program and stand as it has,—the guardian of social and industrial justice.

The Place of the Nurse in Industry

BEFORE defining the place of the nurse in industry, it is helpful to review the philosophy which has prompted so many large employers of labor to create as an integral part of their commercial establishments medical departments and to tell you briefly what the functions of these medical departments should be.* A more comprehensive picture of the entire situation can thus be secured, and the nurse seen in her relationship to the whole.

Industry, as the years have progressed, has come more and more to the realization that the application of the healing arts to the activities of commerce is necessary. After all, industry depends upon the most complicated of all machines—the human machine—for the carrying out of its essential functions. In years gone by, management has comprehended fully the necessity for a modern plant and equipment, if its product was to be produced economically and successfully. It has only been in comparatively recent years, however, that the necessity for proper attention to the human machine has been fully realized.

Some employers, understanding the problem very vaguely, have tried to meet it by installing a nurse in their establishments, and then delegating to her the task of performing all of the odd jobs that no one else wants, such as the dispensing of aspirin; the conducting of the plant library, the cafeteria, and the recreation fund; and the management of the annual picnic. Many nurses have been called upon to labor under such circumstances, in a futile effort to fulfill to the utmost their high calling. Such an organization is not, in any sense of the word, an industrial medical department.

In creating the medical department, industry must realize that its proposed function must be more than a perfunctory one. It must deal in the most precious of commodities, human life and human health. Such responsibilities are not primarily a nurse's. She has learned to work under the guidance of the physician. She must be his hands, his eyes, and all too often, his brain as well, but she is not his substitute; and it is not fair to her to ask her to assume duties and burdens for which she is ill-suited by training and experience. The intricacies and complexities of industry are such that a nurse cannot hope to find her way alone.

If the industrial medical department is to fulfill its true function to the utmost, it must not be created upon any false or hypocritical grounds. It must be regarded simply and solely as a gesture of good business and not philanthropy. It must serve employer and employee in equal measure, but it must never become paternalistic. In other words, the medical department in industry must be a hard-headed business step toward improving plant production by improving man or woman productivity, just as the installation of a new machine or a new process will increase plant productivity. Fortunately a community of interest exists, so that as the interests of the employer are advanced by intelligent health conservation, so in exact ratio are those of the employee.

* A. D. LAZENBY, M.D., Chief Surgeon, Maryland Casualty Company, Baltimore, Maryland; presented at the Joint Session under the auspices of the Industrial Section, annual meeting, Maryland State Organization for Public Health Nursing, Baltimore, Md., January 29, 1936; published in *Public Health Nursing*, November, 1936.

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In short, industrial medical people, doctors and nurses, must regard themselves as part of the maintenance department of their plant. It is their function to place workers into jobs for which they are suited physically and mentally, just as the plant engineer installs a drill press and not a lathe for a drilling operation. As the maintenance engineer keeps the plant equipment in good repair by constant attention to its mechanism, by lubrication and adjustments as they may be needed, so must the medical department function with regard to the personnel.

The average worker does not want something for nothing. He does not want his employer to provide him with medical attention for his various day-by-day ailments—which by tradition are his own responsibility and prerogative. He would much prefer to see the cost of so-called welfare and paternalistic interference with his own personal activities reflected in his pay envelope. He does need information, guidance and education in matters of health, and such aid he accepts gratefully.

Let us, therefore, regard industrial health activity as a matter of good business—good business for the employee, for the employer and for society as well. Let us regard it as a means of increasing production, of decreasing accidents, of preventing absenteeism, and of improving plant morale for the employer. For the employee, good health offers long life, increased earnings, freedom from injury and the happiness that comes from physical well-being. The industrial medical department must never degenerate into a mere emporium for the dispensing of harmless drugs and the dressing of cut fingers. It must have a definite, positive and constructive program that, while it may vary with the different types of industry, nevertheless marches steadily on toward a fixed goal.

Since the selection of the proper man for the proper job lies, insofar as his physical state is concerned, in the hands of the medical department, the first function which the latter is called upon to perform is the pre-employment examination. The approach to a consideration of this subject must be made from very high ground if if is to be a socially sound as well as an industrially helpful program. Pre-employment examination in industry must never be conducted as primarily a means of barring from employment persons who, through no fault of their own, may be suffering from physical handicaps. Industry cannot hope to absorb only the perfect physical specimens, leaving the others to starve or to become public charges. So a sound pre-employment examination program must be contemplate three aims: first, to place men in jobs for which they are physically and mentally adapted; second, to discover and assist the applicant in correcting remedial physical defects; third, to keep from contact with other workers, persons suffering from infectious diseases.

It is absurd to ask a man with a disease of the heart to engage in strenuous manual labor; and every plant has some jobs which such a handicapped individual can satisfactorily fill. The physically handi-

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capped must gain a livelihood, just as must everybody else, and it is not fair to deny him the opportunity to do so when work suitable for his physical state can be secured for him. It is known that 44% of industrial workers have defective vision, and that 25% have never had those defects corrected. How can a man produce his peak of work if he literally cannot see what he is doing? How can he be safe from accident to himself or to others if he cannot see approaching danger and remove himself quickly from its path?

The man with oral sepsis or infected tonsils may not manifest obvious symptoms, but he is absorbing enough toxic material to impair his efficiency, to encourage illness and absenteeism and to lengthen his reaction time, making him a less useful employee, one more prone to accidents and one who will react less favorably to the stress and strain of industry. These and similar impairments will usually be discovered at the first examination. And a truly constructive health activity must not only demonstrate them to the individual, but must educate him in the necessity of correcting them, and if necessary, make it possible for him to accomplish this in a manner within the range of his economic possibilities.

Mutual Confidence

AT THE time of the pre-employment examination, the physician and the nurse have an opportunity to learn something about the applicant's health habits, his diet, his recreation and the minor disorders to which he may be frequently subjected. Constructive advice along these lines can be given, a correct mode of living set up, and mutual confidence established. When I say mutual confidence, I mean just that. Nothing kills an industrial health program so quickly or so surely as a patronizing or a paternal attitude by the doctor or the nurse. Both of them—especially the nurse—must be approachable, understanding, sympathetic but never maudlin, and especially diplomatic and tactful. Once a rapport between the employee and the medical department is established, when the employee brings his or her personal problems to the nurse for her advice and counsel, the medical department has opened the door that will lead to success.

Of course, the medical department cares for all of the occupational injuries that occur in the plant. First aid is given, wounds are treated, hospital care is provided when necessary, and operations are arranged, in accordance with the provisions of the workmen's compensation law of the particular state. The nurse is called upon constantly to participate in this work. She performs her duties in a manner in keeping with the best traditions of her profession. She does not undertake surgical procedures herself, because that simply is not her function. She cares for minor wounds and she assists the doctor in caring for the more extensive ones.

The nurse usually directs the surgical technique that is used in the dispensary. In no branch of surgery is scrupulous technique so necessary as in the surgery of trauma. Doctors do not always realize it, but in actual practice it is frequently the nurse who is responsible for this. It is she who sees that dressings, instruments, sutures and gloves are ready, sterile and abundant. It is she who sees that the supply cabinet is well stocked. The nurse generally attends to the details of ordering supplies, and it falls upon her of necessity to look to the interests of the employer in preventing extravagance in the use of dressings, drugs and materials. Since she usually applies the dressings, she is careful to see that they are fully protective, secure and not bulky, and she studies the methods of application of wound protection tion that meets with these requirements. A skillfully applied dressing very often means that a man may remain at work rather than lose several days, besides the economy it effects in the expenditure for expensive dressing material.

Preventive Work

THE medical department must not feel, however, that its responsibility is fully discharged when it treats the injuries that follow an accident. The essence of public health medicine and nursing is the prevention of disease, and the prevention of accidents is quite as important. Industrial accidents exact an awful toll in human life, misery, and money, and prevention lies not alone within the sphere of the safety engineer. The guarding of machines means much, but that does not tell the whole story. The nurse is alert to detect the so-called

OCCUPATIONAL DISEASES

The General Assembly of the State of Illinois has recently passed an Act, covering occupational diseases of Industrial employees. This Act is particularly concerned with diseases of the lungs, and poisoning from certain chemicals.

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repeater, the man who comes in frequently with minor injuries. Perhaps there is something that the engineer can do to make the work of this individual safer, but perhaps the trouble may lie in the worker himself. Perhaps his eyesight is poor, perhaps his hearing is defective, or perhaps he is so toxic from his sluggish eliminative functions that his reaction time is affected. Perhaps he has home worries that have absorbed more of his interest than his job. In cases such as this, the medical department can render assistance to the safety engineer that will be of untold value to him.

Such things as I have mentioned not only cause accidents, but they also cost industry incalculable sums in work spoilage, low efficiency and impaired plant morale. The observant medical department, operating under a far-sighted and broad program, will discover many things that should fall within its scope. It can be one of the most important departments in the organization, instead of being—as is too often the case—the first to be curtailed or eliminated when business begins to slump. I plead for progressive, active, positive scientific medicine in industry, instead of the routine, passive sort of thing that so often exists today, especially in smaller plants.

Occupational Environment

THE occupational environment, in which the employed person spends at least one third of his time, is most important to his health and protection. The medical department must take cognizance of the plant's working conditions. It must study illumination, ventilation, air conditioning, and sanitary conditions in the plant, not so much from the engineering standpoint as from the effect which such conditions have on the health of the worker.

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Often it reqires real salesmanship to convince management that a dollar spent on improvements affecting health is a dollar earned. The industrial physician has a good product to sell, and should encounter little difficulty if he is sure of his ground.

Industrial health requires proper wash room and toilet facilities. One toilet for every 15 to 20 workers is necessary. They must be clean, well ventilated, and convenient. Otherwise faulty habits of elimination are encouraged with sequelae of poor health and decreased efficiency

Occupational Diseases

IN RECENT years, indeed in recent months, the terrific problem of the diseases of occupation is being brought home with dismaying vividness to industry. This situation has been precipitated by two great factors: first, the increase in claims for disability due—or allegedly due—to occupational diseases, and the broadening in so many states of the workmen's compensation acts to include such claims; and second, the fact that in this chemical age so many new substances that may affect health are being introduced into various manufacturing processes.

Silicosis is one of the most impressive of these diseases, both in the problems it creates for the worker and the huge claims that it has created against industry. It is caused by exposure under suitable conditions, and for an adequate period of time, to dust containing silica dioxide or quartz. This is neither the time nor the place to discuss the disease in any detail. Suffice it to say, that without medical advice, industry could not cope with this hazard.

The same is true of exposure to the fumes of lead, chromium, benzene, petroleum derivatives, and the thousand and one industrial poisons that are regularly in use and are being introduced daily. The medical department must not only detect such hazards as they exist in the various processes of manufacture, but it must detect the resulting symptoms in the worker before they become disabling. It must work in the closest harmony with the engineer in eliminating the danger, either by substitution of less dangerous agents, ventilation, or proper individual protection.

To accomplish these objectives that I have briefly discussed, the doctor and the nurse must know every nook and cranny in the factory, all of the various processes, and the physical requirements of the workers who are to carry on these processes. Proper advice on job placement cannot be given unless the doctor and nurse know all about the job.

The medical department should be constantly available to the personnel for the discussion of their health problems, and for the immediate care of minor ailments. Most diseases begin as trifles, and early care will prevent many colds from becoming pneumonia, minor scratches from becoming palmar abscesses. At the same time, care must be taken not to alienate the sympathies of the medical department's great ally, the family physician. The physician in industry is not and must not become a competitor of the physician in private practice, and there is ample room for both, to the benefit of each, and to the greater benefit of the public. The employer should protect his employee from the hazards of occupation, and should assist him in every consistent manner in securing and maintaining health, but he should never assume responsibilities or prerogatives that traditionally belong to the individual.

Community Relationships

BESIDES working in absolute cooperation with private medical practitioners, the industrial medical department should establish contact and maintain intimate relations with existing public health and social agencies. Health departments, various relief organizations, mental hy-

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giene clinics, visiting nurse associations—all these can frequently be of great assistance in individual cases, and likewise can receive substantial aid from industry in many ways other than financial.

The atmosphere of the professional office must always pervade the industrial medical department. The employee must know that what goes on within that office is sacredly confidential. He will not utilize the medical office if he fears that his confidence will be betrayed, or that what he may tell the doctor or the nurse may place his job in jeopardy or impair his relationships with others. Employers must respect this privileged relationship if they expect to get the greatest good from their medical department.

The nurse always wears her uniform while on duty. It inspires not only wholesome awe, but deep confidence as well, and the nurse who is not dressed in uniform, immaculate and trim, is overlooking a great aid to good work.

What does industry offer the nurse? It offers much in scientific interest, in opportunity for service to humanity, and in personal security; but it exacts much in return. What duties and responsibility does it assign to the nurse? It calls upon her to exercise in full measure all of the things she learned in her nursing preparation, and in addition, much that can never be learned or taught.

Qualifications

THE nurse must, of course, be a graduate of a well recognized school of nursing, and should be registered. By the time a woman has successfully passed the rigid sifting for admission to the proper school of nursing and has completed the nursing course, one can assume that she is an exceptional woman. But industry needs the exceptional woman plus. In addition to her professional training, the nurse must be tactful without its being obvious; stern when necessary, without being unkind; sympathetic, but not a giver of sympathy; understanding by instinct; and possessed of an abiding love for her fellow man. These are qualities that can never come by education alone; they are the instinctive traits of a few women. Preparation and previous experience in public health nursing will be most useful in helping the nurse to understand the social implications and to meet the educational opportunities of her job.

At the time of the pre-employment examination, the nurse is available to help the doctor. She does what only a woman can do to put the prospective employee at his ease. She takes the history, weighs and measures the applicant, checks the eyesight and often records the findings, and does the other clerical work involved. If the applicant is a woman, she prepares her for examination, and is always present during the entire examination.

In the dispensary, the nurse greets each arriving patient and puts him at his ease. She is always approachable, friendly, kind, but never personal. Minor wounds and minor ailments are cared for by her. If she feels that a condition is beyond the scope of her training, she calls the doctor and assists him in caring for the patient.

Records must, of course, be kept and except in very large establishments, the nurse must attend to this. Records of themselves mean little; the important thing is to do work worth recording, and to use the records after they have been compiled. They must be legible, accurate and complete, since they have a medicolegal as well as a medical value. A study of work done and conditions encountered in the past, as shown through the intelligent compilation of records, reveals ways of improvement for the future.

The Nurse in the Home

IF THE industry has carried its health conservation so far as to include home visitation of sick employees, the nurse will perform this task. It is here that perhaps her greatest opportunity for service will present itself, and the need for the exercise of her greatest tact will arise. She must never call upon a sick employee as a snooper. That isn't her job at all. She goes as a friend—as her employer's ambassador, as a teacher of health. She must be prepared to render simple nursing service if needed, under the direction of the family physician. Perhaps she may give an enema or a bed bath, perhaps only a word of cheer and encouragement. She may show the wife or mother how to prepare suitable nourishment for the patient, how to ventilate the room, how to prevent the spread of disease.

Often she will find the patient badly in need of medical care without the means of employing a doctor. Maybe a trip to the hospital is needed, and her help and advice will be invaluable in guiding a bewildered family.

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hospitals is groundless, and show them the folly of depending upon a well-intentioned neighbor or the corner drug store for medical counsel. The nurse must enter the home, whether it be that of the president of the company or the humblest laborer, as a friend. She must be equally at ease with the unlettered or with the most cultured. She must command respect, esteem and confidence and these are hers only through her works.

Certain Legal Aspects of Christian Science

THE purpose is to ascertain and analyze the unusual legal aspects of Christian Science.* This is a form of faith healing and mental therapeutics. It was founded by Mary Baker Eddy, of Concord, New Hampshire, in 1866, and bases its teachings upon her writings, the most important of which is "Science and Health, with Key to the Scriptures." This book, popularly known as the Christian Science textbook, is simply a quasi-legal re-interpretation of the Bible as understood by Mrs. Eddy. Its theology is based upon the idea that all human ailments, injuries, diseases, pain and suffering have no real existence and are merely false beliefs, illusions or "error of mortal mind" which can be destroyed by "Truth" through the operation of "Divine Mind" by knowing such to be the truth. It is the application of this fundamental doctrine of Christian Science in the form of inaudible prayer and mental argument by Christian Scientists and Christian Science practitioners[1] to themselves and to men, women and children who are actually suffering, or who merely believe they are suffering from some mental or physical ailment, injury or disease, which constitutes the practice of Christian Science.

Belief in Christian Science: The apparent irrationalism of Christian Science has led to several cases in which the legal rights and remedies of Christian Scientists have been questioned and even denied.

(a) Testamentary Capacity: Matter of Brush[2] was decided in 1901. In this case, the testatrix was a Christian Scientist. In her will, she left $20,000 to the First Church of Christ, Scientist, in New York City. Her relatives sought to have the legacy set aside upon the ground that her belief in Christian Science was an insane delusion and that, therefore, she lacked testamentary capacity. The court decreed that the legacy was valid, and held that "however opposed these teachings (Christian Science) may be to the beliefs or notions of others, they are founded on the religious convictions of those professing them. That being so, the court cannot say that those persons (Christian Scientists) are mentally unsound." The rule laid down in this case is that a belief in Christian Science is not an insane delusion.

* From a Treatise by I. H. Rubenstein, of The Chicago Bar, and published here by his special permission.

1. One who is a specialized practicing Christian Scientist; has met and passed certain requirements of "The Mother Church," The First Church of Christ, Scientist, in Boston, Massachusetts; is registered in the Christian Science Journal; has no other occupation or conflicting interest, and is entitled to charge a fee for his services.

2. 35 Miscel. 689, 72 N. Y. 421.

The Industrial Doctor
OFFICIAL SECTION OF THE NEW YORK STATE SOCIETY OF INDUSTRIAL MEDICINE

Published under supervision of the Ways and Means Committee of the New York State Society of Industrial Medicine. Editorial office, F. E. Redmond, Managing Editor, 406 Root Building, Buffalo, N. Y. Articles appearing herein do not necessarily reflect the opinion or policy of this journal nor of the New York State Society of Industrial Medicine.

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(b) Qualification as a Juror: In re Malvasi's Estate[3] was decided in California in 1929. This was a will contest, involving unsoundness of testator's mind. Mrs. Post, a Christian Scientist, was examined as a juror and was accepted. She joined with the other jurors in upholding the will. Later, counsel for the contestant discovered that Mrs. Post was a Christian Scientist, and made a motion for a new trial on the ground that as a Christian Scientist, Mrs. Post did not believe in the existence of unsoundness of mind because it was a human disease, and that therefore she was disqualified as a juror. In an affidavit against the motion, Mrs. Post deposed that Christian Science was a healing agency and that it at all times recognized the existence of human disease, including mental incompetency. The court denied the motion, stating that Mrs. Post, according to her conception of Christian Science, "understood" Christian Science to recognize the existence of disease, including mental incompetency, and that therefore Mrs. Post was not disqualified as a juror and was also "not chargeable with any misconduct for failure to volunteer information concerning her religious belief and that appellant (contestant) was not deprived of a fair and impartial jury." There can be no doubt that if Mrs. Post had the true conception of Christian Science, which is the non-existence of all human ailments, injuries and diseases, the court certainly would have ruled that she was disqualified as a juror in this case. Thus it can be seen that Christian Scientists are disqualified as jurors in personal injury cases and in all other cases in which human ailments, disease, mental suffering and mental anguish are the issues involved.

Query: Legal status of Christian Scientists as to their competency or qualification for service or duty as judges, lawyers and witnesses because of their belief in Christian Science?

(c) Recovery for Personal Injuries and Mental Suffering: Probably the most interesting case on Christian Science is that of Fort Worth & Denver City Ry. Co. v. Travis,[4] decided by the Texas Court of Civil Appeals in 1907. In this case, plaintiff brought suit to recover damages for his wife's

3. 273 Pac. 1097.

4. 45 Tex. C. A. 117, 99 S. W. 1141.

personal injuries and mental suffering caused by her expulsion from one of the defendant's trains. At the trial, defendant's counsel sought to cross-examine plaintiff's wife to prove that she was a Christian Scientist and therefore was incapable of sustaining physical injury and mental suffering. The trial judge sustained plaintiff's objection to this cross-examination, and judgment of $190 was awarded plaintiff. Upon appeal, judgment was reversed, the court declaring that the trial judge "erred in treating the inquiry as an immaterial one, since the testimony was pertinent to the main and essential issue in the case, to wit, the mental and physical suffering of the witness (plaintiff's wife). If she had such control of her feelings or thought she had, as to render her insensible to pain when she willed to be, we see no reason why that circumstance should not have been considered by the jury in determining the extent of her suffering and the compensation to be made on account of it." In substance, the holding in this case is that Christian Scientists can recover little or no damages for personal injuries, mental anguish, pain and suffering. This rule also is applicable to those cases in which a Christian Scientist brings suit for breach of promise, alienation of affections, seduction, slander, libel, and other suits of like character in which mental suffering or mental anguish is the gist of the action. Notwithstanding the harshness of the effects of this ruling on Christian Scientists, it represents the overwhelming weight of authority in the United States.

Negligence in Failing to Obtain Prompt Medical Care: One who has sustained personal injury through the fault of another is under a duty to secure promptly the necessary medical and surgical advice and treatment, if the nature of the injury is such as reasonably to require it, so as to prevent or reduce aggravation of physical injury and mental suffering. If the injured party is negligent in allowing an unreasonable length of time to elapse between the date of the injury and the time medical and surgical care is resorted to, such negligence is regarded in the eyes of the law as a sufficient intervening cause, and may either bar in toto or reduce to a minimum the amount of damages that can be recovered from the party at fault.

(a) Adult Christian Scientists: The case of Ash v. Barker et al[5] illustrates how the law applies to an adult Christian Scientist who is negligent in obtaining prompt medical care. This is a workmen's compensation case and was decided in California in 1915. The applicant was a middle-aged woman who managed an apartment house. In the course of her employment, she fell from a chair, severely injuring herself. From the date of her accident until 40 days later, when she ended her employment on account of the unbearableness of her suffering, she relied solely upon Christian Science treatments by a practitioner to cure her injury. Shortly afterwards, she submitted to a surgical operation. The evidence showed that she should have taken the operation immediately after the accident. In holding that she was not entitled to compensation, the Industrial Commission declared that Christian Science treatments are not such as "may be reasonably required to cure and relieve where surgical treatment is indicated by the symptoms. In delaying such surgical treatment for more than two months, applicant not only jeopardized her own interests, but the interest of her employer, and in fact slept upon her rights to demand medical and surgical treatment at the expense of her employer or her employer's insurance carrier." The reason for this decision is quite obvious. The law imposes on an adult Christian Scientist the duty of acting as a reasonable and prudent person would act under the circumstances of this case. Here the applicant knew or ought to have known that her injury was of such a serious nature as to require immediate medical attention. Her failure to take such action within a reasonable time after the accident was considered the primary cause of the serious aggravation of her injuries.

(b) Infant Christian Scientists: The law, however, is not so harsh towards infant Christian Scientists of tender years, who have not reached the age of discretion, and who are entirely dependent upon the care given them by their parents or guardians, who are also Christian Scientists. A case on this point was decided in Connecticut in 1932.[6] In this, plaintiff, an eight-year old girl, was just stepping off the edge of the road, when she was struck by defendant's LaSalle sedan which was being driven at a very fast rate of speed. The most serious injury plaintiff sustained was a fractured and dislocated pelvis. Plaintiff and her mother were both Christian Scientists. On the day of the accident, a doctor was called. He gave plaintiff first aid treatment, and had her taken to the hospital where she was given further treatment. Later in the same day, plaintiff's mother took her home against the doctors' warnings. For the next 25 days, no medical treatment was given plaintiff, except some nursing and orthopedic treatments. During this interim, plaintiff also was given Christian Science treatments. Plaintiff brought suit for damages, and her mother brought suit for expenses incurred. At the trial, the evidence showed that plaintiff had a permanent pelvic deformity which would interfere with

5. 2 Cal. I. A. C. 577.

6. Lange v. Hoyt, 114 Conn. 590, 159 Atl. 575.

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normal childbirth. Defendant contended that plaintiff's injury was aggravated by her not having the proper surgical treatment during the 25-day period, and that proper surgical care from the beginning would have effected a substantial cure. The court upheld judgment for the plaintiff, declaring that "the test of conduct on the part of plaintiff in promoting a recovery from injuries suffered is one of reasonable care, and cannot be made to depend upon the idiosyncrasies of personal belief no matter how honestly held. . . . A child of the age of eight years is necessarily dependent upon her parents as regards the steps to be taken to bring about a recovery from an injury, and if she is not herself guilty of negligence or improper conduct, the failure of the parents to take the proper steps to that end, by a parity of reasoning, cannot be such a cause of any portion of the injuries as will defeat a recovery for all the results of the defendant's wrongdoing." The trial judge in this case had instructed the jury very favorably for the defendant in so far as the mother's claim was concerned. In reviewing this point, the Supreme Court of Connecticut strongly intimated that such instruction was justified by the facts of this case.

Civil Actions by Practitioners: The only case ever decided by the higher courts relative to a Christian Science practitioner bringing suit on a matter pertaining to Christian Science is the case of Wheeler v. Sawyer[7] which was decided by the Supreme Court of Maine in 1888. In this case, a practitioner brought suit against the heir of his deceased patient to recover $30 compensation for Christian Science treatments given to the patient shortly before his death. The court upheld judgment for the practioner on the ground that the patient chose that form of treatment and agreed to pay for it, and that there was "nothing unlawful or immoral in such a contract." The rule deducible from the reasoning of this case is that where a patient engages a practitioner, the latter can recover his fee for rendering Christian Science treatments in an action at law against the patient or his estate. However, in order to recover against a third party, that is, one who has not received the treatments, as an employer or a casualty insurance company, the practitioner must prove that the third party had agreed to pay him for such Christian Science treatments. In the absence of such agreement, the practitioner cannot recover his fee even though the third party is legally responsible for the patient's disease or ailment or injury or mental suffering. The reason generally given in such cases for a third party's nonliability for a practitioner's fee, is that Christian Science treatments are not such as will reasonably "relieve and cure" a human ailment, injury or disease.[8]

Civil Actions Against Practitioners: Dissatisfaction with the results of Christian Science treatments given by practitioners, and general dislike and distrust of practitioners, together with wrongful conduct on the part of practitioners, have led patients, their relatives and individuals to institute legal proceedings against practitioners for "malpractice," deceit, divorce and fraud.

(a) Deceit and "Malpractice." The case of Speed v. Tomlinson[9] was decided by the Supreme Court of New Hampshire in 1904. Plaintiff, a middle-aged woman, had an attack of appendicitis. She informed defendant, a Christian Science practitioner, of the nature of her trouble and her dread of a surgical operation. Defendant told plaintiff that a surgical operation was unnecessary, and that he could cure her with Christian Science treatments. Plaintiff employed the defendant for several days, during which time her illness increased. She finally placed herself in the hands of a physician, submitted to a surgical operation, and was cured. Plaintiff brought suit against the practitioner for "malpractice" and deceit . The evidence tended to show that the defendant's "treatment" was injurious to the plaintiff, and that if it had been persisted in, a cure would have been impossible. The court found for the defendant, declaring that one who holds himself out as a Christian Science practitioner and is employed to treat any human ailment, injury or disease according to the methods followed by such practitioners, is required only to possess the "knowledge" and to exercise the "skill" of the ordinary practitioner, and that there was "nothing here to show that defendant failed to do so in giving Christian Science treatment to the plaintiff." The court further stated that "it is a matter of common knowledge that honest men, not only in the past, but do now, entertain religious beliefs which appear to the great majority of their fellow men unsound and incapable of belief," and that defendant's representations were not fraudulent, but merely a strong expression of a religious opinion based on his apparently sincere belief in Christian Science."

(b) Fraud: An action can be maintained against a Christian Science practitioner for fraud by relatives of a deceased patient who was defrauded by the practitioner. This is the holding in Christian v. Canfield[10] which was decided in New Jersey in 1931. The facts were as follows: Miss Christian died at the age of 67, being a confirmed invalid for over 25 years. For several years prior to her death, she relied exclusively upon Christian Science treatments given by defendant, a "Christian Science healer." After Miss Christian's death, her relatives brought suit in equity to set aside two instruments made by Miss Christian which conveyed securities valued at $13,730 as a gift to defendant, upon the grounds that the instruments were secured by fraud and undue influence. The evidence showed that defendant had charge of Miss Christian's financial affairs, and that the latter was under the influence of opiates at the time the instruments were executed. In entering a decree in favor of the relatives, the court declared, "at the outset, we start with the presumption against the bona fides of the transaction because of the confidential and fiduciary relationship, and the burden of showing the contrary is upon the beneficiary. That includes the burden of showing not only that the transfer was not procured by fraud or undue influence, but that the nature of the transaction was fully understood by decedent, and that she had independent advice."

(c) Divorce: Surprising as it may seem, a married person may obtain a divorce on the ground that his (or her) spouse is a Christian Science practitioner. Such a decision was rendered by the Supreme Court of New Hampshire in the case of Robinson v. Robinson.[11] In this case, the husband was a druggist. He and his wife were a very happy and loving couple until two years after their marriage, when his wife became interested in Christian Science and became a "Doctor of Christian Science." Her practice of giving Christian Science treatments caused the husband to be ridiculed. As a result, his business suffered, his health became impaired and he became morose and despondent. He begged his wife to give up only her practice of Christian Science and not her belief, but she refused. He thereupon brought suit for divorce on the grounds of extreme cruelty. The court declared that the husband was entitled to a decree of divorce because the wife's conduct as a Christian Science "Doctor" came within the terms of the statute as such behavior on her part as to have the effect of endangering the health and reason of her husband.

Custody of Infant Children: Where parents, who have infant children, are having their marital relations adjudged in a divorce court, and one of the parents is a Christian Scientist, the trial judge in determining which parent should have custody of the children, would award custody to the parent who was not a Christian Scientist, because it would be for the best welfare of the children to receive medical treatment when ill or injured rather than Christian Science treatments.[12] Another reason for such decision is that the probabilities are that a parent, who does not believe in the strict necessity of personal hygiene, or in the existence of disease, or in sanitary or quarantine measures because of a belief in Christian Science, will succumb to an infectious or contagious disease more readily than the average person, and in close contact with his (or her) children in such diseased condition would endanger seriously the health and even the lives of the children.

Institutions of Christian Science: In several states, unsuccessful attempts have been made to incorporate institutions of Christian Science as religious corporations. These institutions, incidentally, generally consist of a church, a school for training practitioners, and a sanatorium where patients (sometimes called "guests), who are supposed to be suffering from strong and persistent "illusions" of illness, injury or disease, are given Christian Science treatments, food and lodging. Such types of school and sanatorium respectively charge their pupils tuition, and their patients for the expenses that arise in

7. 15 Atl. 67.
8. Ash v. Barker, et al., 2 Cal. I. A. C. 577 (1915).
9. 73 N. H. 46, 59 Atl. 376.
10. 108 N. J. Eq. 547.
11. 66 N. H. 600 (1891), 23 Atl. 362.
12. Rex v. Lewis, 6 Ont. L. R. 132, 1 Brit. R. C. 732.

their "treatment and care." In denying incorporation of such Christian Science institutions as religious corporations, the courts have based their decisions upon the grounds that such institutions are against public policy in that they are a menance and danger to the public health,[13] that they are irreligious and that they are founded solely for the pecuniary benefit of their founders or officers.[14]

Query: Validity of gifts, legacies, bequests and devises to the "Mother Church," The First Church of Christ, Scientist, in Boston, Massachusetts, and other institutions of Christian Science?

Criminal Aspects of Christian Science : (a) Medical Practice Acts: Every state in the Union has a medical practice act. These acts, for most part, are very similar. In substance, they define what constitutes the practice of medicine, state the educational requirements and training that are necessary for a license to practice medicine, and contain penal provisions subjecting persons, who have failed to comply or who have violated any provisions of the act, to either a heavy fine or imprisonment, or both. At the present time, 12 states, Arkansas, Colorado, Connecticut, Kentucky, Louisiana, Maine, Massachusetts, Minnesota, North Dakota, South Dakota, Tennessee and Wisconsin, by express provision exempt the practice of Christian Science from the penal provisions of their medical practice acts. Twenty-five states, Arizona, California, Florida, Georgia, Idaho, Illinois, Kansas, Michigan, Missouri, Nebraska, Nevada, New Hampshire, New Mexico, New York, North Carolina, Oklahoma, Oregon, Rhode Island, South Carolina, Texas, Utah, Vermont, Virginia, Washington, Wyoming, (and the District of Columbia), make such exemption by general provision as "not applying to those persons who endeavor to heal or cure the sick and suffering by prayer or spiritual means or as an exercise of the tenets of their religion." The medical practice acts of 11 states, Alabama, Delaware, Indiana, Iowa, Maryland, Mississippi, Montana, New Jersey, Ohio, Pennsylvania and West Virginia, have no exemptionary provisions whatsoever relating to the practice of Christian Science. Quite significant is the fact that all of the states, expressly or by implication, prohibit the practice of Christian Science where it would violate the laws regulating quarantine and sanitary matters, and where the practitioner pretends a knowledge of medicine and surgery or makes use of any drugs or other material remedies or agencies.

Restrictions on Christian Science Practice: The practice of medicine consists of two elements: the first is that there must be a diagnosis of the disease, ailment or injury; the second is that the treatment must be based upon such diagnosis.[15] In the practice of Christian Science, neither of these two elements is present. For this reason, it may be stated as a general rule that the practice of Christian Science for a fee or gift, or gratuitously does not constitute the practice of medicine, and therefore is not subject to the penal provisions of a state medical practice act.[16]

However, the Supreme Courts of both Nebraska[17] and Ohio [18] have held that the giving of Christian Science treatments for a fee, but not gratuitously or for a gratuity does constitute the practice of medicine, and makes the practitioner liable to criminal prosecution. Likewise appearing to be in accord with these two states are Pennsylvania[19] and Missouri.[20] In a case decided by the highest court in New York [21] it was held that the proper place for a practitioner to give Christian Science treatments is at his own home, or at the home of his patient or at the church itself; and that it is a question for the jury to determine as to whether a practitioner, who maintains an office in a loop building, and there gives treatment for pay only, is using Christian Science as a cloak to shield a business enterprise, and therefore in reality is practicing medicine.

Where an infant child is suffering from some infectious or contagious disease or serious ailment or injury, and his parent, a Christian Scientist, calls in a practitioner to give Christian Science treatments to the child who dies as a result of the lack of medical care, such a parent, under a statute requiring a parent to furnish necessaries to his infant children, can be convicted of manslaughter for causing the death of his child.[22] The law, however, is otherwise where the patient is an adult sui juris, and provided that the quarantine and sanitary laws are not violated.

Christian Scientists and Public Health: The case of State Ex. Rel. v. Probst[24] illustrates how Christian Scientists are restricted, in so far as public health is concerned, in the practice of their beliefs. Plaintiff's six-year old daughter attended a public school in Minneapolis. She was sent home from school, because she was suffering from hoarseness and a sore throat. She was told that she would be allowed to return only upon furnishing the school authorities with a satisfactory health certificate from a physician or upon passing a physical examination to be given her by the school physician. Plaintiff and his daughter (?) refused to do so because of conscientious objections, incident to their being Christian Scientists. Plaintiff brought a writ of mandamus to secure his daughter's readmission to the school. In affirming the dismissal of the writ, the Supreme Court of Minnesota declared that "it is one of the primary duties of the (school) board to protect the health of the many children in their charge. . . . Efforts for prevention do much to avoid an epidemic. The demand upon the school board for vigilance in this respect is imperative." The exclusion of the plaintiff's daughter from the school, the court further stated was a valid and lawful exercise of the inherent police power of the school board. In substance, the holding in this case is that the proper public authorities can restrict Christian Scientists in the practice of their beliefs, if in any way they should tend to endanger the public health. The law laid down in this case is also applicable to Christian Scientists who are inmates of governmental institutions, such as old age and pauper homes; a fortiori, in cases where Christian Scientists are inmates of prisons or insane asylums or are serving the government as enlisted men in the army or navy. In all of such cases, Christian Scientists could (and would) be compelled, as a matter of public policy for preserving the general public health, to submit to medical examination and treatment. The same especially holds true in times of war, flood, epidemic or great disaster.

13. First Church of Christ, Scientist, 205 Penn. 543 (1903), 55 Atl. 536.
14. In re St. Louis Institute of Christian Science, 27 Mo. A. 633 (1887).
15. State v. Mylod, 20 R. I. 632 (1898), 40 Atl. 753.
16. Bennett v. Ware, 4 Ga. A. 297 (1908). Evans v. State, 9 Ohio D. 222 (1889). State v. Lee Chu, 130 Oregon 109 (1929). State v. Mylod, 20 R. I. 632 (1898). Bd. of Med. Ex. v. Freenor, 47 Utah 447 (1916).
17. State v. Buswell, 40 Neb. 158 (1894), 58 N. W. 728.
18. State v. Marble, 72 Ohio St. 21 (1905), 73 N. E. 1063.
19. First Church of Christ, Scientist, 205 Penn. 543.
20. St. Louis Inst. of C. S., 27 Mo. A. 633. Kansas City v. Baird, 92 Mo. A. 212 (1901).
21. People v. Cole, 219 N. Y. 98 (1916), 113 N. E. 790.
22. Rex. v. Lewis, 6 Ont. L. R. 132 (1903), 1 B.R.C. 732.
23. Ibid.
24. 165 Minn. 361 (1925), 206 N. W. 642.

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THE following ruling of Industrial Commissioner Elmer F. Andrews, applies to the supplying of names of authorized physicians by insurance carriers to their policyholders.

Rules and Regulations Relating to the Supplying of Names of Authorized Physicians by Insurance Carriers to Their Policyholders and the Procedure to be followed by Medical Inspectors and Consultants Engaged by Carriers and Employers.

In order that all communications by insurance carriers to their policyholders relative to medical care of employees shall be in conformity with the Compensation Law and the rules and regulations promulgated by the Industrial Commissioner regarding the free choice of any physician on the panel, the following rules have been promulgated:

Rule No. 1: The supplying of names of authorized physicians by insurance carriers to their policyholders is in contravention to Section 13, as amended by Chapter 258 of the Laws of 1935. Such policyholders and all employers may secure a list of all authorized physicians in the vicinity of their places of business by applying to the Industrial Commissioner of the Department of Labor.

Rule No. 2: Any physician who acts in the capacity of medical inspector for an insurance carrier or employer in the case of an injured employee under the care of another physician shall not participate in the treatment of said injured employee except in the operation of a rehabilitation clinic or bureau under Section 13-J of the Law. Nothing herein contained affects the right of transfer as provided in Section 13-a (3).

Rule No. 3: When a medical examination is had under Section 13-a (4) it shall be by a qualified physician at a place reasonably convenient to the claimant and in the presence of the claimant's physician, if in the latter's opinion his presence is necessary. A copy of all notices of requests for examinations must be sent to the attending physicians.

Rule No. 4: No physician designated by an insurance carrier or an employer as a consultant, in the case of an injured employee, shall subsequently participate in the medical or surgical care of said injured employee, except with the written consent of the injured employee and his attending physician. Nothing herein contained affects the right of transfer as provided in Section 13-a (3).

The Mad Hatter

AS TO what makes the mad hatter mad (September 12 Vox Pop), I was told by my grandfather, who was son of a hat manufacturer, that continued employment in the "finishing room," brushing the felt in close hot chemical-laden air, was the cause. The kind employer limited the time for each brusher, but the thoughtless one would keep the man in the finishing room until the poisonous fumes drove him mad.*

* STUART WHITTEN, in "Vox Pop," *Liberty Magazine.*

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A MEDICAL MAGAZINE—PROFESSIONALLY EDITED

(Conforming, in its advertising, to the standards of the Council on Pharmacy and Chemistry of the A. M. A.)

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Reg. U. S. Pat. Off.
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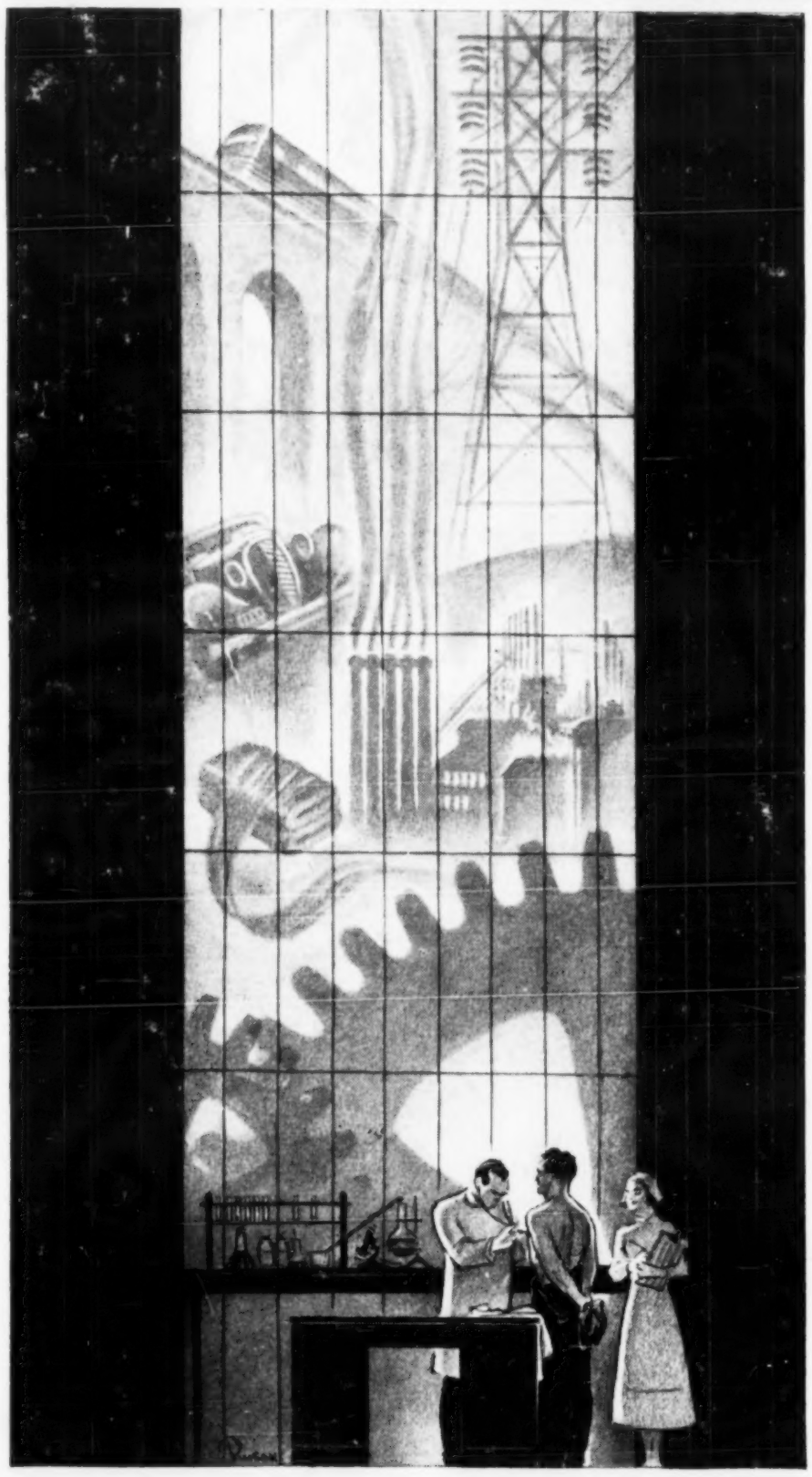

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